

# Baptiste Dépalle, PhD

+1 617 230 3171 - [baptiste.depalle@outlook.com](mailto:baptiste.depalle@outlook.com) – Cambridge, MA  
[www.BaptisteDepalle.com](http://www.BaptisteDepalle.com)

## Mechanical and Biomaterial Engineer seeking an R&D position in the biotechnology industry

Versatile mechanical and materials scientist with over eight years of experience in structural and mechanical characterization of biomaterials and biological tissues

Expertise in molecular structural analysis, non-linear mechanics, and failure mechanisms of biological tissues

Proven ability to plan and execute complex projects, collaborate with interdisciplinary teams, and deliver high quality reports and presentations

Experience with computer aided design and manufacturing to develop innovative new technologies or products

### TECHNICAL SKILLS

Mechanical testing	Micro- and nano-indentation testing (Hysitron TriboIndenter) Atomic force microscopy (AFM) Mechanical testing: compression, flexion (Bose electroforce 3300) Digital image correlation (ITK, Icasoft, Vic-3D)
Programming	Languages: Matlab , C/C++ , python, tcl, Linux
Image processing	Filtering, segmentation Registration 2D and 3D 3D reconstruction (X-ray and electron tomography) Mesh generation Software: Avizo, ImageJ, ITK, Matlab
Molecular modeling	Model creation: proteins, biominerals Steered molecular dynamics (SMD) Accelerated molecular dynamic (Replica exchange) Coarse-graining (Martini) and Reactive forcefields (ReaxFF) Software: LAMMPS, CHARMM, GULP, NAMD, VMD, AtomEye
Electron microscopy	Transmission electron imaging (FEI Titan, Jeol) Scanning electron microscopy and focus ion beam (Zeiss Auriga) Electron diffraction and microdiffraction Sample preparation (staining, embedding, microtoming)
Design and fabrication	Finite element simulation: model creation and analysis (Abaqus) Computer assisted design (CAD) and Computer aided manufacturing (CAM) (Fusion 360, Solidworks) Prototyping: 3D printing, Computer numerical control (CNC) milling

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## EXPERIENCE

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London,  
UK

2015 - 2017

### Imperial College London – Department of Materials Postdoctoral Research Fellow

- Characterized the nanostructure of bone samples with various pathologies and genetic mutations to evaluate the origins of bone fragility
- Developed high-resolution diffraction methods to quantify and map orientation and degree of alignment of bone mineral components using electron microscopy
- Developed sample preparation techniques to minimize electron beam damage and improve contrast in biological samples to ensure high resolution images
- Initiated and managed collaborations with several university partners including Northeastern University and University College London and clinical researchers at University of Staten Island and University of St. Louis to improve understanding of mineralized tissue pathologies

Cambridge,  
MA

2012 - 2015

### Massachusetts Institute of Technology (MIT) – Department of Civil and Environmental Engineering Postdoctoral Research Fellow

- Discovered fundamental role of intermolecular cross-links and mineralization in bone mechanics
- Developed mesoscale molecular models of bone tissue to explore the link between nano-structure and mechanical bone function
- Mentored students and conducted tutorials teaching molecular modeling methods

Lyon,  
France

2009 - 2010

### Université de Lyon - Department of Mathematics Lecturer

- Taught freshman mathematics to students taking competitive entrance examinations for French engineering schools; topics included algebra, series, Taylor expansion, derivation, differential equations, and integration.
- Created course and exam materials

## EDUCATION

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Lyon,  
France

June 2011

### Université de Lyon and Institut National de la Santé et de la Recherche Médical PhD in Biomechanics

**Title:** Influence of tissue heterogeneity on the mechanical behavior of human trabecular bone

#### **Key Contributions:**

Demonstrated that mineral heterogeneity significantly affects stress fields in bone trabeculae proving that it is a major determinant of bone fragility in osteoporosis and should be taken into account for fragility diagnostic

- Established the roles of organic and mineral components of human bone tissue on the bone's elastic and plastic behaviors, respectively; at the osteon level, bone elastic behavior mainly depends on mineral quantity whereas its plastic behavior depends on collagen maturity
- Analyzed the influence of finite element modeling parameters (size and element formulation) on the assessment of trabecular bone tissue's mechanical response
- Proved that microtomography can be used to quantify bone mineral heterogeneity in trabecular bone

#### **Methods:**

- A combination of nanoindentation, microradiography and Fourier-transform infrared spectroscopy (FTIR)

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- Evaluated heterogeneity of trabecular bone mineral density in three-dimensions using microtomography; the results were validated against quantitative microradiography, the gold-standard method for measuring bone mineral density using 2D/3D registration methods.

Lyon,  
France  
June 2007

## Institut National des Sciences Appliquées de Lyon MS, Mechanical Engineering, Minor in Biomechanics

- Thesis project awarded **first prize** in the Itech Challenge, which is run by both *Lyon Fabrics and Chemistry Institute* and *French Fabrics Equipment Designer Association*. The project studied the forces exerted on a brassiere. Our team used the garment's fabric as a deformation sensor using image stereo-correlation methods
- The aim of the ITech challenge was to encourage creativity among students by offering projects originating from industry and was judged by a committee composed of technical and scientific experts, university professors, and researchers.
- Studied industrial design for one year at Lund University of Technology, Sweden

## PROFESSIONAL AWARDS AND AFFILIATIONS

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- Awarded a highly competitive Wellcome Trust foundation fellowship for four years of Postdoctoral research at MIT and Imperial College London (2012). The Wellcome Trust Foundation is a global charitable foundation that provides support for scientists to work at the interfaces between biology/medicine, engineering, and physical sciences
- Outstanding Paper Award, American Society of Mechanical Engineers (2013) for the paper "Influence of carbonate substitutions on bone apatite mechanical properties"
- Young Investigator Award, French Society of Mineralized Tissue Biology (2009 and 2010) for the work "Is finite element modeling feasible at the vertebrae with clinically achievable resolution?" and "Contribution of bone microstructural characteristics to mechanical properties evaluated at bone structural unit level"
- *Professional Membership*: Materials Research Society, European Microscopy Society, European Society of Biomechanics

## PUBLICATIONS, PRESENTATIONS, MENTORSHIP

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- 11 peer-reviewed articles published in international journals
- Reviewer for five international journals in bioengineering and material science
- Over 10 talks presented at regional and international meetings
- Mentored Masters' and PhD students from biology and engineering schools

## REFERENCES

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Markus Buehler (MIT), Research Supervisor - [mbuehler@mit.edu](mailto:mbuehler@mit.edu), 617.452.2750

Alexandra Porter (Imperial College London), Research Supervisor – [aporter@ic.ac.uk](mailto:aporter@ic.ac.uk), +44.20.7594.9691

Sandra Shefelbine (Northeastern University), Research Supervisor – [s.shefelbine@neu.edu](mailto:s.shefelbine@neu.edu), 617.373.3199

Helene Follet (Université de Lyon, France), PhD Advisor – [helene.follet@inserm.fr](mailto:helene.follet@inserm.fr), +33.47.211.7486

## OTHER

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**Interests:** Rock climbing and hiking (five-year member of the French federation); Building musical instruments using both manual hand tools and computer aided manufacturing (CNC router and 3D printing);

**Languages:** English (fluent), French (native), and Spanish (working proficiency)