Aurélien Gourrier – CV

CNRS Research Director (DR)

Optics & Imaging team (OPTIMA)

Laboratory for Interdisciplinary Physics (LIPhy)
UMR 5588 CNRS Univ. Grenoble Alpes
140 rue de la Physique, 38400 St Martin d'Hères, France
@ResearchGate, @LinkedIn, @GoogleScholar, @Hal

Research activities

As a physicist and materials scientist, my goal is to understand fundamental structure-function relationships in mineralized tissues such as bones, teeth, ivory, while also addressing applied biomedical or archaeological questions.

My research consists in developing new imaging methods, analytical tools and concepts to decipher the functional impact of the material's nanostructure, multiscale hierarchy, disorder, interfaces and structural gradients of the tissue, on one side, and of the cellular network topology and multiscale porosity on the other.

My main expertise is in synchrotron X-ray imaging and analysis with scattering contrast (SAXS, WAXS, XRD), fluorescence optical microscopy and non-linear imaging methods (two-photon, second and third-harmonic generation) and analytical methods related to the physics of complex systems. One specificity is that we work on the whole chain from advanced sample preparation, instrument development, to scientific analysis.

Academic career

2024→: CNRS Research Director at the Laboratory for Interdisciplinary Physics (LIPHY), Univ. Grenoble Alpes, France.

2012-24: CNRS Researcher at LIPHY, Grenoble, France..

> **2020-24:** Head of the Optics & Imaging team (OPTIMA) (10 scientists, 4 engineers and technicians, > 10 postdocs and PhD students).
>
> **2018**: Habilitation (HDR) in Physics (Physics for Life Sciences) from Univ. Grenoble Alpes: *Bone quality at the nanoscale, a contribution from quantitative scanning-SAXS imaging*.

2007-12: CNRS Researcher at the Laboratoire de Physique des Solides (LPS), Orsay, France.

> **2005-16**: Visiting Scientist at the European Synchrotron Radiation Facility (ESRF) in the Structure of Soft Matter & X-ray Nanoprobe groups, ID13 beamline.

2004-06: Post-Doctoral Researcher at the Biomaterials dpt. of the Max-Planck Institute for Colloids & Interfaces, Potsdam, Germany.

Education

2000-04: Ph.D. of the University Grenoble Alpes (formerly Joseph Fourier) and the European Synchrotron radiation facility (ID13 beamline, ESRF), Grenoble, France

1999-2000: MSc (DEA) in Structural Biology Grenoble, Paris, Strasbourg, France

1995-99: Materials Science Engineering, Polytech Grenoble, France
& McMaster University, Canada

Academic research projects and funding

2024-29: Chair of the Multidisciplinary Institute for Artificial Intelligence (MIAI) Grenoble – 400 k€
Geometry-aware multimodal super-resolution imaging of microscopic cellular porosity in bones and teeth
Partners: E. Brun (STROBE Lab, INSERM Grenoble), M. Langer (TIMC Lab, CNRS Grenoble), E. Vennat (LMPS, Centrale-Supelec, Paris-Saclay) and D. Rousseau (LARIS, Univ. d'Angers)

2021-24: Research Grant from the Human Frontier Science Program (HFSP) – 1.1 M$
The role of bone cellular and sub-cellular porosity network connectomics on calcium homeostasis
Partners: K. Grandfield, McMaster University (Canada, coordinator), A. Carriero, The City College of New York (USA)

2014-18: ANR MULTIPS – 506 k€
MULTIPhysic & multiScale assessment of bone quality
Partners: P. Laugier (coordinator), Q. Grimal, LIB, Paris; H. Follet, D. Farlay, INSERM, Lyon; F. Peyrin, CREATIS, Lyon.

2018-22: France-Canada Research Fund (FCRF) program – 18 k€
Investigating Healthy & Pathological Bone with Synchrotron X-Ray Scattering & Electron Microsc.
Partners: K. Grandfield, McMaster University (Canada)

2013-16: PhD grant AGIR IDEX Grenoble: *Non-linear optical studies of bone*.

2013-16: PhD grant Nanoscience Foundation Grenoble: *Nanoscale characterization of mineral nano-crystals in bone*.

2013-14: Défi Instrumentation aux limites CNRS: *qsSAXSI Biomat* – 15 k€

2010-11: PNRCC (Programme National sur la Connais-sance et la Conservation des Matériaux du Patrimoine Culturel): *Potentiel informatif des ossements chauffés en contexte archéologique* - Project leader : I. Reiche, C2RMF – 60 k€

2010-11: PIR CNRS Interface physique chimie biologie: soutien a la prise de Risque – 50 k€

2010-11: Bonus Qualité relations Industrielles (BQI) Université Lyon (Project leader G. Boivin, INSERM) – 90 k€

Innovation projects

2022-24: Maturation Program of the SATT LINKSIUM – 242.3 k€
ThickMap project: High precision contactless thickness mapping device for metrology

2020-21: CNRS (INP) Innovation Program – 96 k€
ThickMap project **FR patent 3107346**

2019: Challenge Out-of-labs of the SATT LINKSIUM – 15 k€
ThickMap project

2005-11: Consultant for PHI-AXIS, Antony, France.

Teaching

2012→: *Matériaux Biologiques & Biomimétisme*. 5th year course, Polytech' Grenoble, Materials Science and Engineering Dpt.

2014: HERCULES Specialized Courses: Non-atomic resolution scattering in biology and soft matter (HSC16). Lecture : *SAXS imaging in scanning mode: application to biological tissues*.

Academic Societies

2023→ : member of the GDR Imabio (ImaBio), IASIS (IASIS).

2021-24: executive committee (COMEX) of the Labex CEMAM (Centre of Excellence of Multifunctional Architectured Materials, Grenoble > 2021). Co-responsible for the IRP6 *Biomaterials*.

2019→: Associate member of the Multidisciplinary Institute in Artificial Intelligence (MIAI) Grenoble.

2018→: member of the Société Française de Biologie des Tissus Minéralisés (SFBTM).

2017: co-founding member of the French Chapter of the International Medical Geology Association (IMGA, project leader: Laurent Charlet, ISTerre, Grenoble)

2012→: co-founding member of the AFURS (French National Organization of Synchrotron Users), committee member (Bureau 2012-17) and french delegate for the ESUO (European Synchrotron Users Organization 2015-16).

2010-15: member of the Comité de Liaison de la Section 05 of the CNRS.

Lab & University duties and activities

2020-24: Head of the Optics and Imaging team (OPTIMA) of the LIPHY.

2020-24: Member of the Commission *Hygiène et Sécurité* of the LIPHY.

2020-23: Member of the Web commission of the LIPHY.

2020→: Member of the IT commission of the LIPHY.

2019-23: Member of the Cellule Data Stwewardship of the Univ. Grenoble Alpes.

2013-15: Elected member of the first LIPHY laboratory council.

Conferences, school & workshop organization

2019→: Member of the organizing committee of the European School of Nanosciences and Nanotechnology (ESONN) school.

2018: Organization committee of the CNRS-McMaster workshop, Grenoble, France.

2015: Organization committee of the RX 2015 : XI^{ème} Colloque Rayons X et Matière, Grenoble, France.

2014: Organization committee of the Séminaire Dautreppe 2014 : Matière et symétrie, Grenoble, France.

2011: Organization and Scientific committee of the International Workshop ArBoCo : 'Towards a better understanding and preservation of archaeological and historical bone materials', C2RMF, Paris, France.

General public

2014: Fête de la science : public show : *Des cristaux géologiques aux oursins*.

2014: Conference Les midis de Minatec : *Grandeur et servitude de la nanostructure des tissus osseux*.

2012: Fête de la science : public show : *Imagerie laser: comment voir l'invisible ?*

Student supervision

PhDs

2024-27: Thomas Cotty, PhD Univ. Grenoble Alpes. *Topological analysis of the cellular porosity network in teeth at the organ level.* Co-directed with David Rousseau, LARIS, Univ. Angers.

2022-25: Lucas Chatelain, PhD Univ. Grenoble Alpes. *Connectomic analysis of multiscale cellular networks in mineralized tissues.* Co-directed with David Rousseau, LARIS, Univ. Angers.

2022-25: Lauren Anderson, cotutelle PhD Univ. Grenoble Alpes / McMaster University (Canada). *Deep-learning super-resolution fluorescence microscopy of cellular networks in bones & teeth.* Co-directed with K. Grandfield, McMaster University & David Rousseau, LARIS, Univ. Angers.

2021-25: SeungHwan Lee, cotutelle PhD Univ. Grenoble Alpes / Pusan National University (Korea). *Functional relevance of the multiscale cellular porosity characterization in dentin.*. Co-directed with K. Kyhm, Pusan National University.

2013-16: Mariana Verezhak, PhD Univ. Grenoble Alpes. *Multiscale characterization of bone mineral: new perspectives in structural imaging using X-ray and electron diffraction contrast*. Co-directed with M. Plazanet, MODI, LIPHY.

2012-16: Rachel Genthial, PhD Univ. Grenoble Alpes. *Non-linear optical microscopy characterization of the lacuno-canalicular system in bone*. Co-directed with D. Débarre, DYFCOM, LIPHY.

PhDs co-supervised

2015-18: Alexander Groetsch: *Micro- and nanomechanics of mineralised collagen fibre elasto-plasticty*. Trained on Synchrotron SAXS analysis (15 % PhD).

2011-14: Marie Albéric: *Etude chimique et structurale de l'ivoire d'éléphant moderne et ancien.* Directed by Ina Reiche (C2RMF). Trained on Synchrotron SAXS analysis (20 % PhD).

2006-09: Céline Chadefaux: *Etablissement d'une nouvelle stratégie analytique multiéchelle de détermination de l'état de conservation des os et bois de cervidés archéologiques.* Directed by Ina Reiche (C2RMF). Trained on Synchrotron SAXS analysis (20 % PhD).

MSc

2022: Lucas Chatelain : 5th year engineering ENSE3 SICOM of INPG. *Graph analysis of the lacuno-canalicular network in bone.*

2022: Mirkó Mocskonyi : MSc Physics, Photonics & Nanotechnology, Univ. de Bourgogne. *Topological characterization of cellular porosity in tooth dentin*.

2022: Robin Farges : 5th year engineering Polytech'Grenoble, Informatique et Électronique des Systèmes Embarqués. *Imagerie métrologique par balayage rapide*.

2021: Paula Yago : M1 Biomedical Engineering, Universidad del Rey Juan Carlos (Espagne). *Image Segmentation performance of cellular porosity networks by graph analysis*.

2021: Pedro Alberti da silva, 5th year engineering Polytech'Grenoble, Informatique et Électronique des Systèmes Embarqués. *Metrological signal analysis through signal processing*.

2020: SeungHwan Lee, MSc Cognomechatronic. *Confocal fluorescence study of the cellular porosity network in dentin*. Co-directed with K. Kyhm, Pusan National University, Korea.

2020: Jane Sedlak, MSc Chemistry. *Understanding the Photodegradation of Elephant Ivory*. Co-directed with I. Reiche, Chimie ParisTech.

2020: Clément Bouteaud, 5th year engineering Polytech'Grenoble, Informatique et Électronique des Systèmes Embarqués. *Réalisation d'un prototype de cartographie dimensionnelle sub-micronique sans contact*.

2019: Dakota Binkley, MSc Biomedical Engineering. *Confocal fluorescence microscopy study of the time sequence of mineralization in the ewe*. Co-directed with K. Grandfield, McMaster University.

2019: Axelle Weber, 5th year engineering Ecole Nationale Supérieure d'Électronique, Informatique, Télécommunications, Mathématique et Mécanique de Bordeaux (ENSEIRB). *Apport de la théorie des graphes à la segmentation d'images de microscopie*.

2018: Ursule Muendy, M2 Ingénieurie de la Santé et Biomatériaux. *Étude de la porosité dentinaire*. Co-directed with E. Vennat, LMSSMat, Centrale Supelec Palaiseau.

2017: Nicolas Parisse, 4th year Engineering Insitut d'Optique Palaiseau. *Analyse par graphes de réseaux complexes en imagerie multimodale; application au cas du réseau lacuno-canaliculaire de l'os*. Co-directed with D. Rousseau, CREATIS Lyon.

2017: Yacine Cerbah, M1 Nanoscience & Nanotechnology Univ. Grenoble Alpes. *Nanoscale resolution optical imaging of bone and teeth porosity using single particle tracking*. Co-directed with A. Dupont, MOTIV, LIPHY.

2016: Tess Berthier, M1 (Magistère) Physics Univ. Paris-Sud Orsay. *Étude des caracteristiques physiques du réseau cellulaire osseux*. Co-directed with D. Débarre, DYFCOM, LIPHY.

2013: Flavien Ralite, M1 Physics Univ. Nantes. *Étude du domaine de validité du modèle physique pour l'analyse SAXS appliquée à l'étude de la structure osseuse*.

2012: Bénédicte Bertin, M2 Nanoscience & Nanotechnology Univ. Grenoble Alpes. *Structural characterization of mineral nanoparticles in bone using synchrotron microfocus X-ray scattering and raman spectroscopy imaging techniques*.

2011: Wissal Ben Naceur, 5th year engineering Sup' Com Tunis, Tunisia. *Débruitage par méthode d'ondelettes des données acquises par micro-imagerie SAXS pour l'analyse ultra-structurale de l'os*. Co-directed with C. Chappard, B2OA, Univ. Paris Diderot.

Undergraduate

2013: Estelle Lemaitre, L3 Physics Univ. Bordeaux. *Study of bone ultrastructure by Raman micro-spectroscopy*. Co-directed with M. Plazanet, MODI, LIPHY.

Lab training & projects

2023: 2 students M1 Physique Univ. Grenoble Alpes, research project on *fluorescence photobleaching*

2022: 4 students 5th year Polytech'Grenoble, Informatique et Électronique des Systèmes Embarqués, tutored project (½ day / week for 3 months): *Étude d'une lentille acoustique pour la microscopie optique.*

2019: 6 students 4th & 5th year Materials Science Engineering (Polytech' Grenoble), tutored project (½ day / week for 3 months): . *Recherche de partenaires industriels dans le secteur des biomatériaux pour applications biomédicales*.

2018: **8** students 4th & 5th year Materials Science Engineering (Polytech' Grenoble), tutored project (½ day / week for 3 months): . *Recherche de partenaires industriels dans le secteur des biomatériaux pour applications biomédicales*.

2018: Fabien Taramasco, 4th year Materials Science Engineering (Polytech' Grenoble), technical tutored project (1 day / week for 4 months): *Fluorescence microscopy study of the penetration of ORMOCOMP resin in embedded bone and dentin samples*.

2015: Kannan Prashanth, Michael Buhagiar, Vincent Pasquier, Rafael Mestre Castillo, M2 Nanoscience & Nanotechnology (Univ. Grenoble Alpes), lab training (½ day / week for 1 month): *Fluorescence microscopy study of the penetration of resin in embedded bone samples*.

Project Engineer supervision

2023-24: Arnaud Bardouil, Project ThickMap – Programme Maturation SATT LINKSIUM. *ThickMap prototype development & industrial partnerships*.

2021-23: Camille Bataille, Project ThickMap – Programme Prématuration CNRS INP & Maturation SATT LINKSIUM. *ThickMap prototype development & industrial partnerships*.

Selected Conference Presentations

EBMC 2025: 47th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Copenhagen, Denmark.
Deep learning based super-resolution of the cellular network in Dentin.
L. Anderson, D. Rousseau, K. Grandfield, A. Gourrier.

NetSci 2025: International Conference of the Network Science Society , Maastricht, Netherlands.
Graph modeling of cellular porosity in dentin.
L. Chatelain, E. Vennat, N. Tremblay, D. Rousseau and A. Gourrier.

JFBTM 2025: 25eme Journées Françaises de Biologie des Tissus Minéralisés, Reims, France.
The small world of odontoblasts: are your friends my friends ?.
A. Gourrier.

SFB 2023: 48eme Congrès de la Société de Biomécanique, Grenoble, France.
[keynote] *Impact biomécanique de la structure nanoéchelle de l'os : un éclairage à la lumière du Synchrotron.*
A. Gourrier.

CN 2023: 12th International Conference on Complex Networks and Their Applications.
Graph modeling of cellular porosity in dentin.
L. Chatelain, E. Vennat, N. Tremblay, D. Rousseau, A. Gourrier.

ASBMR 2018: American Society for Bone and Mineral Research, Quebec, Canada.
Is cortical porosity associated with degraded material quality ?
A. Gourrier, H. Follet, D. Farlay, G. Boivin

IBDW/ESUCB 2017: 21st International Bone Densitometry Workshop & 7th European Symposium on Ultrasonic Characterization of Bone, Banz, Germany.
Nano-Imaging of bone mineral using qsSAXSI: a contribution to specifying bone quality.
A. Gourrier, M. Verezhak, D. Farlay, H. Follet

ESB 2016: 22nd Congress of the European Society of Biomechanics, Lyon, France.
Analyzing the ultrastructural determinants of bone micromechanical properties: a multiscale approach.
A. Gourrier, M. Plazanet, G. Boivin, D. Farlay, P. Laugier

BiominXIII (2015): 13th International Symposium on Biomineralization, Granada, Spain.
Mineral nanocrystals in bone: does size really matter ?
A. Gourrier, M. Verezhak, M. Plazanet, M. Burghammer, B. Weinhauser, I. Reiche, D. Farlay and G. Boivin

IMC 2014: 18th International Microscopy Congress, Pragues, Czech Republic.
Nanoscale characterization of hierarchical biological materials using synchrotron quantitative scanning-SAXS imaging.
A. Gourrier, M. Burghammer, I. Reiche and G. Boivin

BD13 (2013): 7th International Bone Diagenesis Meeting, Lyon, France.
[keynote] *Understanding ancient bone materials at the nanoscale: how far do we need to go ?*
A. Gourrier & I. Reiche.

ESUCB 2013: 5th European Symposium on Ultrasonic Characterization of Bone, Granada, Spain.
[keynote] *Deciphering the strutural origin of the microelastic properties of bone tissue.*
A. Gourrier, M. Granke, K. Raum, F. Peyrin, A. Saied, P. Laugier.

IMAGIV 2012: New Methods for Life Sciences Imaging, Lyon, France.
Multiscale characterization of nanostructured hierarchical materials using synchrotron quantitative
scanning-SAXS imaging. A. Gourrier, O. Bunk, M. Burghammer, I. Reiche and G. Boivin

EUROMAT 2011: European Congress on Advanced Materials and Processes, Montpellier, France.
Multiscale characterization of nanostructured ancient materials using qsSAXS imaging: Artificially heated bone.
A. Gourrier, O. Bunk, K. Müller and I. Reiche.

IPANEMA Workshop 2011: Synchrotron Radiation for Ancient Materials, Saclay, France.
Potential applications of qsSAXS imaging for the characterization of ancient materials.
A. Gourrier.

THERMEC 2011: International Conference of Proceeding and Manufacturing of Advanced Materials, Québec, Canada.
Multiscale characterization of nanostructured biological materials using quantitative synchrotron scanning-SAXS imaging.
A. Gourrier, O. Bunk, M. Burghammer and J. Doucet.

International ArBoCo Workshop 2010: Towards a better understanding and preservation of archaeological and historical bone materials, Paris, France.
Heating bone for the fabrication of tools in prehistoric times: advantage or disadvantage ?
A. Gourrier, O. Bunk, K. Müller and I. Reiche

SAS 2009: XIV International Conference on Small-Angle Scattering, Oxford, UK.
Revealing the nanostructure of biological hard tissues using scanning SAXS imaging.
A. Gourrier, M. Burghammer, S. Schoeder, C. Riekel, J. Doucet, P. Roschger, K. Klaushofer, C. Li, O. Paris, P. Fratzl.

SR2A 2008: Synchrotron Radiation in Arts and Archaeology, Barcelona, Spain.
Synchrotron SAXS/WAXS investigation of archaeological bone and antler from the Neolithic lake site of Chalain (France).
C. Chadefaux, K. Mueller, A. Gourrier, O. Paris and I. Reiche.

ISSRNS 2008: 9th International School and Symposium on Synchrotron Radiation in Natural Science, Ameliówka, Poland.
Revealing the nanostructure of biological materials using scanning X-ray imaging with SAXS(/WAXS) contrast..
A. Gourrier, C. Li, O. Paris and P. Fratzl.

SAS 2006: XIII International Conference on Small-Angle Scattering, Kyoto, Japan.
Scanning small-angle X-ray scattering study of the effect of fluoride treatment on osteoporotic bone mineralization using synchrotron radiation (Poster).
A. Gourrier, C. Li, O. Paris and P. Fratzl.

SRPS III (2006): Synchrotron Radiation in Polymer Science, SPRING-8, Japan.
Scanning SAXS/WAXS studies of deformation mechanisms in soft condensed matter using nano /microindentation : from synthetic polymers to hair.
A. Gourrier, C. Riekel, O. Paris.

BiominIX (2005): 9th International Symposium on Biomineralization, Pucon, Chile.
Scanning SAXS-WAXS : shining light on biomineralization problems.
A. Gourrier, W. Wagermaier, H.S. Gupta, O. Paris, P. Fratzl.

ECI Instrumented Indentation Testing in Materials Research and Dvpt. (2005): Fodele, Greece.
Hardness testing under a different light : combining synchrotron X-ray microdiffraction for polymer fibers studies.
A. Gourrier, M.C. García-Gutiérrez, C. Riekel.

Publications

Peer-reviewed

33- L Chatelain, N Tremblay, E Vennat, E Dursun, D Rousseau, A Gourrier *Cellular porosity in dentin exhibits complex network characteristics with spatio-temporal fluctuations* **PLoS One** 20, e0327030.
https://doi.org/10.1371/journal.pone.0327030 (open access)

32- SG Lee, E Vennat, K Kyhm, A Gourrier (2025) *Label-free visualisation of histological features in human teeth using autofluorescence imaging* **Biomed Opt Express** 16, 2792-2807, 2025
https://doi.org/10.1364/BOE.564484 (open access)

31- LR Couoh, L Bucio, JL Ruvalcaba, B Manoel, T Tang, A Gourrier, K Grandfield (2024) *Tooth acellular extrinsic fibre cementum incremental lines in humans are formed by parallel branched Sharpey's fibres and not by its mineral phase* **J Struct Biol** 216, 108084.
https://doi.org/10.1016/j.jsb.2024.108084 (open access)

30- A Groetsch, A Gourrier, D Casari, J Schwiedrzik, J Shephard, J Michler, P K Zysset, U Wolfram (2023) *The elasto-plastic nano- and microscale compressive behaviour of rehydrated mineralised collagen fibres* **Acta Biomater** 164, 332-345.
https://doi.org/10.1016/j.actbio.2023.03.041 (open access)

29- S.G Lee, M Kim, S Jeong, J Hwang, J Kim, A Gourrier, J.C Vial, K Kyhm (2022) *Autofluorescence Loss in Photobleaching for Human Dentin ex vivo* **Curr Opt and Photon** 6, 86-91.
https://doi.org/10.3807/COPP.2022.6.1.086 (open access)

28- C Micheletti, A Hurley, A Gourrier, A Palmquist, T Tang, F.A Shah, K Grandfield (2022) *Bone mineral organization at the mesoscale: A review of mineral ellipsoids in bone and at bone interfaces* **Acta Biomater** 142, 1–13.
https://doi.org/10.1016/j.actbio.2022.02.024 (accepted manuscript open access – embargo 04/2024)

27- D.M Binkley, J Deering, H Yuan, A Gourrier, K Grandfield (2020) *Ellipsoidal mesoscale mineralization pattern in human cortical bone revealed in 3D by plasma focused ion beam serial sectioning* **J Struct Biol** 212, 107615.
https://doi.org/10.1016/j.jsb.2020.107615 (accepted manuscript open access)

26- X Cai, H Follet, L Peralta, M Gardegaront, D Farlay, R Gauthier, B Yu, E Gineyts, C Olivier, M Langer, A Gourrier, D Mitton, F Peyrin, Q Grimal, P Laugier (2019) *Anisotropic elastic properties of human femoral cortical bone and relationships with composition and microstructure in elderly* **Acta Biomater.,** 90, 254-266.
https://doi.org/10.1016/j.actbio.2019.03.043 (accepted manuscript open access)

25- A Groetsch, A Gourrier, J Schwiedrzik, M Sztucki, J Shephard, J Michler, P K Zysset, U Wolfram (2019) *Compressive behaviour of uniaxially aligned individual mineralised collagen fibres at the micro- and nanoscale* **Acta Biomater.,** 89, 313-319.
https://doi.org/10.1016/j.actbio.2019.03.043 (accepted manuscript open access)

24- R Genthial, M Gerbaix, D Farlay, J Derouard, J.C Vial, L Vico, E Beaurepaire, D Débarre and A Gourrier (2019) *Third harmonic generation imaging and analysis of the effect of low gravity on the lacuno-canalicular network of mouse bone* **PLoS ONE**, 14, e0209079.
https://doi.org/10.1371/journal.pone.0209079 (open access)

23- M Plazanet, M Verezhak, J Tasseva, P Bartolini, A Taschin, R Torre and A Gourrier (2018) *Time-domain THz spectroscopy of the characteristics of hydroxyapatite provides a signature of heating in bone tissue* **PLoS ONE**, 13, 0201745.
https://doi.org/10.1371/journal.pone.0201745 (open access)

22- M Verezhak, E Rauch, M Veron, C Lancelon-Pin, J.L Puteaux, M Plazanet and A Gourrier (2018) *Ultrafine perturbations of bone mineral at the individual nanocrystal level revealed by ACOM-TEM* **Acta Biomater.**, 73, 500–508
https://doi.org/10.1016/j.actbio.2018.04.004 (accepted manuscript open access)

21- M Albéric, A Gourrier, W Wagermaier, P Fratzl and I Reiche (2018) *The three-dimensional arrangement of the mineralized collagen fibers in elephant ivory and its relation to optical properties* **Acta Biomater.**, 72,342-351.
https://doi.org/10.1016/j.actbio.2018.02.016 (accepted manuscript open access)

20- B Brunel, C Blanch, A Gourrier, V Petrolli, A Delon, J.F Joanny, R Carminati, R Pierrat and G Cappello (2017) *Structure and dynamics of multicellular assemblies measured by coherent light scattering* **New J Phys.**, 19, 073033
https://doi.org/10.1088/1367-2630/aa7b0f (open access)

19- R Genthial, E Beaurepaire, M.C Schanne-Klein, F Peyrin, D Farlay, C Olivier, Y Bala, G Boivin, J.C Vial, D Débarre and A Gourrier (2017) *Label-free imaging of bone multiscale porosity and interfaces using third-harmonic generation microscopy* **Sci Rep.**, 7, 3419.
https://doi.org/10.1038/s41598-017-03548-5 (open access)

18- A Gourrier, C Chadefaux, E Lemaitre, L Bellot-Gurlet, M Reynolds, M Burghammer, M Plazanet, G Boivin, D Farlay, O Bunk and I Reiche (2017) *Nanoscale modifications in the early heating stages of bone are heterogeneous at the microstructural scale* **PLoS ONE**, 12, e0176179
https://doi.org/10.1371/journal.pone.0176179 (open access)

17- M Albéric, M Dean, A Gourrier, W Wagermaier, J.W.C Dunlop, A Staude, P Fratzl and I Reiche (2017) *Relation between the macroscopic pattern of elephant ivory and its three-dimensional micro-tubular network* **PLoS ONE**, 12, e0166671
https://doi.org/10.1371/journal.pone.0166671 (open access)

16- E Vennat, W Wang, R Genthial, B David, E Dursun and A Gourrier (2017) *Mesoscale porosity at the dentin-enamel junction could affect the biomechanical properties of teeth* **Acta Biomater.**, 51, 418–432
http://dx.doi.org/10.1016/j.actbio.2017.01.052 (accepted manuscript open access)

15- L Bertrand , S Bernard, F Marone, M Thoury, I Reiche, A Gourrier, P Sciau and U Bergmann (2016) *Emerging Approaches in Synchrotron Studies of Materials from Cultural and Natural History Collections* **Topics Curr Chem.**, 374, 1-37.
http://dx.doi.org/10.1007/s41061-015-0003-1 (accepted manuscript open access)

14- M Albéric, A Gourrier, K Müller, I Zizak, W Wagermaier, P Fratzl and I Reiche (2014) *From macro to nano-scale early elephant tusk diagenesis induced by marine environment* **Palaeogeogr Palaeocl.**, 416, 120-132.
http://dx.doi.org/10.1016/j.palaeo.2014.09.006

13- M Granke, A Gourrier, F Rupin, K Raum, F Peyrin, M Burghammer, A Saied and P Laugier (2013) *Microfibril orientation dominates the microelastic properties of bone tissue at the lamellar length scale* **Plos One**, 8, e58043.
http://dx.doi.org/10.1371/journal.pone.0058043 (open access)

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https://www.pnas.org/doi/pdf/10.1073/pnas.1109243109 (open access)

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