

## Pierre Gueriau

PhD. in palaeontology

**Revealing fossil anatomies and preservation pathways using advanced imaging**

ORCID: 0000-0002-7529-3456

Website: pierre.gueriau.fr



Date of birth: 8 June 1987

Nationality: French

Chemin de la Cure 10  
1008 Prilly (Switzerland)

Phone: +33 (0)6 03 87 27 29  
Email: pierre.gueriau@hotmail.fr

### Research topics and keywords

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- **Palaeobiology:** taxonomy, systematics and palaeoecology of Palaeozoic arthropods
- **Taphonomy of well-preserved fossils:** authigenic mineralization of soft-tissues, depositional environments and trace element geochemistry
- **Development of advanced 2D and 3D imaging techniques:** synchrotron X-ray fluorescence, absorption, diffraction and scattering scanning, semi-quantitative micro-tomography, ultraviolet-visible-infrared luminescence imaging.
- **Field work:** fossil collection and stratigraphical study

### Current Position

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02/2023- **Junior lecturer (“premier assistant”)** University of Lausanne, Switzerland

### Former Positions and Education

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- 07/2021-01/2023 **Research engineer** Muséum national d’Histoire naturelle (MNHN), Paris, France  
*Advanced imaging of fossils and other natural history specimens*
- 12/2019-01/2021 **SNSF researcher** University of Lausanne, Switzerland  
*Organic geochemistry of Cambrian fossils.* PI of a *Spark* funding from the SNSF
- 2018/06-2019/11 **SNSF post-doctoral researcher** University of Lausanne, Switzerland  
*Shedding new light on the Fezouata biota (Lower Ordovician, Morocco) using advanced spectro-imaging techniques.* PI: A. Daley
- 2016/05-2018/05 **Post-doctoral researcher** CNRS, USR 3461 IPANEMA, Gif-sur-Yvette, France  
*Fossilization and diagenesis in a Cretaceous Lagerstätte.* Supervisor: L. Bertrand
- 2014/11-2016/05 **Post-doctoral researcher**, DIFFABS beamline, SOLEIL synchrotron, Gif-sur-Yvette  
*X-ray imaging and spectroscopy.* Supervisor: D. Thiaudière
- 2011/11-2014/10 **PhD, Palaeontology**, MNHN, Paris, France, *best distinction*  
*The continental aquatic arthropod fauna from the Famennian (Late Devonian) of Strud, Belgium: taxonomy, palaeoecology and taphonomy using synchrotron 2D imaging.*  
Supervisors: G. Clément & S. Charbonnier

### Publications

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52 international peer-reviewed publications and 912 citations; H-index = 17 (from Google Scholar).

Recent notable publications related to the research outlook:

Celeux G., Cohen S.X., Grimaud A. & **Gueriau P.** 2022. Hierarchical clustering of spectral images with spatial constraints for the rapid processing of large and heterogeneous datasets. *SN Computer Science* 3, 194.

**Gueriau P.** et al. 2020. A new Devonian euthycarcinoid evidences the use of different respiratory strategies during the marine-to-terrestrial transition in the myriapod lineage. *Royal Society Open Science* 7: 201037. [OA]

**Gueriau P.** et al. 2020. Oxidative conditions can lead to exceptional preservation through phosphatization. *Geology* 48 (12): 1164–1168. [OA]

Georgiou R., **Gueriau P.** et al. 2019. Carbon speciation in organic fossils using 2D to 3D x-ray Raman multispectral imaging. *Science Advances* 5: eaaw5019. [OA]

## Approved Research Projects

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### Research grants obtained:

**2022 call for "BRAIN-be 2.0 Research Program" of the Belgian Science Policy Office.** 230'999 € for the project "To colour or not to colour: COLOUR patterns and pigments in INvertebrates from the PALAEOzoic of Belgium" (**Co-coordinator**, with *B. Mottequin (Royal Belgian Institute of Natural Sciences, Bruxelles, Belgium)*).

**2020 call for "BRAIN-be 2.0 Research Program" of the Belgian Science Policy Office.** 154'551 € for the project "Deciphering early stages of VERTEbrate evolution: insights from long IGnored Belgian Devonian fossil Organism" (**Co-coordinator**, with *B. Mottequin (IRSNB) and P. Janvier (MNHN)*).

**2019 call for "Spark rapid funding of unconventional ideas" projects of the SNSF.** 109'168 CHF for the project "Breathing new life into dead fossils: Can geochemical characterization of biomolecules be used to enhance paleontological anatomy descriptions and reveal the affinities of enigmatic fossil animals?" that employed me from Dec. 2019 to Jan. 2021. (**Principal Investigator**).

**2015-2016 call for "Collaborative Research Projects" of the "France-Stanford Center for Interdisciplinary Studies.** 15'000 US\$ for the project "X-Ray Imaging of Cultural Heritage – Bringing to Light our History" (**Co-proposer**, in collaboration with *U. Bergmann (SLAC, Stanford University) and L. Bertrand (IPANEMA)*).

**2014 call for projects of the "ATM Interactions Minéral-Vivant" (MNHN).** 1'500 € to conduct quantifications of trace elements in well-preserved fossils (**Principal Investigator**).

**2014 call for projects of the "ATM Formes" (MNHN).** 1'500 € to perform X-ray micro-tomography on well-preserved fossil crustaceans (**Principal Investigator**).

### Synchrotron beamtime allocated:

38 proposals allocated (11 as Principal Investigator) since February 2013 at SOLEIL, LNLS (Campinas, Brazil), the ESRF (Grenoble, France) and Diamond (Didcot, UK), accounting for a total of 204 days of beam time. I have also participated in experiments at SSRL (Stanford, USA) and the Swiss Light Source (Villigen, Switzerland).

## Conference Presentations

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24 talks (including 3 invited) in international conferences; 7 in national or local events.

### Invited Seminars

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6 invited in-person seminars, at the *MNHN* (2013), *SLAC National Accelerator Laboratory* (Stanford, USA, 2016), *Muséum d'Histoire Naturelle de Genève* (2019), *Laboratoire de géologie de Lyon* (2021), *IPANEMA* (Gif-sur-Yvette, 2021), and *Centre de Recherche sur la Conservation* (Paris, 2022).

1 invited virtual seminar in the framework of the Pal(a)eo EaRly Career Seminar series (2023).

### Awards

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Prize for the best poster presented by a student. 9th SOLEIL Users' Meeting, Palaiseau/ Saint-Aubin (France), January 23–24 2014.

Winner of the "Palaeovision Fossil Contest" organized during the 64th Annual Meeting of the Palaeontological Association (virtual meeting), on December 18, 2020.

## Teaching and Supervision of Students

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**Teaching:** in total, and embracing all the rare opportunities I had to teach, I have a teaching experience of 97h30, including 36h30 of lectures, 4h of tutorials, 57h of practicals (including the implementation of virtual practicals during the Covid-19 pandemics) about **palaeontology**, **taphonomy** and **imaging**, and 21 days of field camps of **paleontology**, **geological mapping** and **sedimentology**.

**Supervision** of 5 Bachelor, 6 M.Sc. and participation in the supervision of 5 PhD students.

## Collections Activities and Responsibilities

**Reorganization and databasing** of the early vertebrate material from the Lower Devonian of Svalbard (1969 CNRS-MNHN expedition), MNHN Palaeontological Collections, 2011 (10 months).

**Assistance in the organization and management** of the Fezouata Collection (Ordovician of Morocco), UNIL, 2018-2020.

## Other Academic Activities

### **Organisation of scientific conferences and meetings:**

Initiator and organiser of the *Young Natural History scientists' Meetings* (2014–2019).

Chairman of the Palaeontology and Palaeo-environments session during the *Synchrotron Radiation in Art and Archaeology 2014 Meeting* (Musée du Louvre, Paris, September 2014).

Organiser of a symposium about fossil imaging and a mid-congress excursion at the SOLEIL synchrotron during the *5<sup>th</sup> International Palaeontological Congress* (MNHN, Paris, July 2018).

Chairman during the *66th Annual Meeting of the Palaeontological Association* (Cork, Ireland, July 2022).

### **33 Peer-reviewing work for international journals:**

**Multidisciplinary journals:** incl. PNAS, Scientific Reports, PLoS ONE, Royal Society Open Science, The Science of Nature, PeerJ.

**Earth Sciences and Palaeontology journals:** incl. Geology, Earth-Science Reviews, Palaeo3, Palaeontology Journal of Systematic Palaeontology, Cretaceous Research, Palaeontologica Electronica, Palaios.

### **Others reviewing activities:**

4 Synchrotron proposals (SSRL) and 2 regional funding proposals (Ile-de-France, DIM MAP).

## Science Outreach Activities

4 invited public conferences in local geology or paleontology events (France).

Participation to the job fair of my former middle school (Héricourt, France) to present the job of palaeontologist, almost each year since 2016.

1 interview in the French scientific radio program “*la tête au carré*” of *France Inter* (November 11, 2016), 3 interviews for print media, and I also acted as scientific advisor for French scientific magazine articles.

1 web article on early terrestrial ecosystems (URL: <https://www.encyclopedie-environnement.org/en/life/first-terrestrial-ecosystems/>) [available in English and French], 1 international scientific magazine article (Gueriau P. & Bertrand L. 2015. Deciphering exceptional preservation of fossils through trace elemental imaging. *Microscopy Today* 23(3): 20–25).

3 chapters in books for the general public (book titles: “Paléontologie d’aujourd’hui”, EDP Sciences, and “La Terre, le vivant, les humains : petites et grandes découvertes de l’histoire naturelle”, La Découverte).

## Institutional Activities and Responsibilities

2022-	<b>Member of the board and Treasurer of the <i>Association Paléontologique Française</i></b>
2021-	<b>Member of the Steering Committee of the <i>AST-RX</i> <math>\mu</math>CT platform, MNHN, Paris</b>
2021-2023	<b>Member of the Imaging Pole of the <i>Plateforme Analytique du Muséum</i>, MNHN, Paris</b>
2016-2018	<b>Referent of the USR 3461 IPANEMA within the <i>RTP Tomo3D</i> of <i>CNRS-INEE</i></b>
2016-2018	<b>Manager of the 3D imaging workstation, USR 3461 IPANEMA, Gif-sur-Yvette</b>
2014	<b>Student representative, council of the Department of Earth Sciences, MNHN, Paris</b>
2013-2014	<b>Organizer of 3 paleontological fieldwork campaigns, Belgium (6 weeks in total)</b>