CAMILLE GODBILLOT

Post-doctoral researcher in biogeochemistry and paleoclimatology
Institut de Recherche pour le Développement (IRD), France

Aix-en-Provence, France
Email: godbillot@cerege.fr
Native French speaker, Fluent English, Basic Spanish

RESEARCH INTERESTS

I study the impact of present and future environmental changes on the biomineralization of marine organisms. I have a particular interest in groups that contribute significantly to sedimentary deposits (coccolithophores, diatoms, bivalves, etc.). As contributors to the silica and carbon pumps, their biological production represents a climate feedback that remains poorly constrained and is of interest for future climate projections. Trained in geochemistry, I also develop and use automated imaging and neural network-based counting techniques to study these different groups of marine organisms.

Keywords: Climate change • Nannoplankton • Carbon cycle • Neural networks • Proxy development

EDUCATION

Oct. 2018 – Apr. 2022	**PhD in Earth Sciences** I Sorbonne Université I Paris, France
Sep. 2016 – July 2018	**MSc in Earth Sciences** I Sorbonne Université I Paris, France
Sep. 2013 – July 2016	**Dual degree in Earth Sciences and History** I Université Pierre et Marie Curie & Paris-Sorbonne I Paris, France
	Student-at-Large Program I The University of Chicago I Chicago, USA *2015-2016* I Followed classes in the Geophysical Sciences & History Departments I GPA: 3.89

RESEARCH

Institut de Recherche pour le Développement I Aix-en-Provence, France I Callao, Peru

Host laboratories : Centre de Recherche et d'Enseignement de Géosciences de l'Environnement (CEREGE) – Instituto del Mar del Perú (IMARPE)

Oct. 2023 – (Sept. 2025)	**Post-doctoral researcher for the DEEP-UP project (PI : C. Godbillot)** *Spatial and temporal changes in the phytoplankton community of the Humboldt Current and links with environmental changes*

Aix-Marseille Université I Aix-en-Provence, France

Host laboratory: Centre de Recherche et d'Enseignement de Géosciences de l'Environnement (CEREGE)

May 2022 – Sept. 2023	**Post-doctoral researcher in the RapMed Project (PI: T. de Garidel-Thoron)** *Response of marine nanoplankton to environmental forcings: insights from two sediment trap series over the last decade* ◇ Development and use of automated imaging techniques (optical microscopy) and AI-based (CNN) solutions for the classification of diatom and coccoliths in sediments ◇ Analysis of the links between plankton community changes and environmental variables, and its consequences on carbon burial in the region.

Sorbonne Université I Paris, France

Host laboratory: Institut des Sciences de la Terre de Paris (ISTeP)

Oct. 2018 – Apr. 2022	**PhD Candidate**

Thesis: Biogeochemical response of Pleistocene coccoliths to pCO_2 changes

◇ Micropaleontological and isotopic ($\delta^{13}C$, $\delta^{18}O$) analyses of coccoliths from Termination II (*ca.* 130 ka) from the mid-latitude North Atlantic

◇ Development of a transfer function between coccolith geochemistry and aqueous CO_2 concentrations derived from ice core atmospheric CO_2 records.

Apr. 2017 – July 2018	**Research intern**
(9 months)	

◇ 2nd year: Culture experiment response of coccolithophore calcification and organic matter production to an Anthropocene-like rise in CO_2 levels.

◇ 1st year: Provenance study of multiple oyster populations from their Rare Earth Element content.

TEACHING EXPERIENCE

Oct. 2018 – Mar. 2022	**Sorbonne Université** I Earth Sciences Department I 64 hrs/yr

First year undergraduate classes

◇ Introduction to the Earth System: Atmosphere, Ocean, Critical Zone, Deep interior

◇ Introduction to observation methods in earth sciences: Microscopy, cartography, etc.

Second year sedimentology classes

Mar. 2016 – June 2016	**The University of Chicago** I Languages Department I 6 hrs/wk

15-minute one-on-one interviews in French with undergraduate students.

SUPERVISION EXPERIENCE

Mar. 2025 – June 2025	**Primary supervisor of Guilhem Le Bars (Master's 1)**

Project: "Changes in the phytoplankton community during El Niño events"

Jan. 2024 – June 2024	**Co-supervisor of Mathias Ageron (Master's 2, supervisor T. de Garidel-Thoron)**

Project: "Variability of faunas and morphometric traits of benthic and planktonic foraminifera in the eastern Mediterranean during the sapropel S1 episode: development of an automation method" – training in the development and analysis of automated detection models using convolutional neural networks.

Jan. 2023 – June 2023	**Primary supervisor of Baptiste Pesenti (Master's 2)**

Project: "Study of community changes in calcareous and siliceous phytoplankton from the DYFAMED sediment trap series in the Ligurian Sea" – training in sample preparation, automated microscopy techniques, data processing, and visualization (R, etc.).

PUBLICATIONS

- **Published or submitted in peer-reviewed journals (*Supervised student)**

Godbillot C., Pesenti B.*, Leblanc K., Beaufort L., Chevalier C., Di Pane J., Durrieu de Madron X., Marchant R., D. Q. Le T., de Garidel-Thoron T. Contrasted trends in phytoplankton diversity, size structure and carbon burial efficiency in the NW Mediterranean Sea under shifting environmental conditions. (Submitted)

Godbillot, C., Marchant, R., Beaufort, L., Leblanc, K., Gally, Y., Le, T. D. Q., Chevalier, C., & De Garidel-Thoron, T. (2024). A New Method for the Detection of Siliceous Microfossils on Sediment Microscope Slides Using Convolutional Neural Networks. Journal of Geophysical Research: Biogeosciences, 129(9), e2024JG008047. https://doi.org/10.1029/2024JG008047

Godbillot, C., Minoletti, F., Bassinot, F. & Hermoso, M. Parallel between the isotopic composition of coccolith calcite and carbon levels across Termination II: developing a new paleo-CO_2 probe, Climate of the Past**, 18, 449–464, **2022**.

Mouchi, V., **Godbillot, C**., Dupont, C., Vella, M., Forest, V., Ulianov, A., Lartaud, F., de Rafélis, M., Emmanuel, L., and Verrecchia, E. P.: Provenance study of oyster shells by LA-ICP-MS, Journal of Archeological Science, 132, 105418, https://doi.org/10.1016/j.jas.2021.105418, **2021**.

Hermoso, M., **Godbillot, C.**, and Minoletti, F.: Enhancing Our Palaeoceanographic Toolbox Using Paired Foraminiferal and Coccolith Calcite Measurements From Pelagic Sequences, Frontiers in Earth Sciences, 8, 1–5, https://doi.org/10.3389/feart.2020.00038, **2020**.

Mouchi, V., **Godbillot, C.**, Forest, V., Ulianov, A., Lartaud, F., De Rafélis, M., Emmanuel, L., and Verrecchia, E. P.: Rare earth elements in oyster shells: Provenance discrimination and potential vital effects, Biogeosciences, 17, 2205–2217, https://doi.org/10.5194/bg-17-2205-2020, **2020**.

- **In preparation**

Walla T., Geslin E., Barras C., Lanoy L., Marchant R., **Godbillot C.**, de Garidel-Thoron T. Identification of benthic foraminifera using automated image recognition. In preparation for Journal of Micropaleontology.

CONFERENCES (SINCE 2021)

Phytoplankton response to environmental shifts in the Mediterranean Sea using novel deep-learning protocols. **EGU 2025**.

Reconstruire la concentration en CO2 atmosphérique dans le passé par l'étude des effets vitaux des coccolithes. **ClimPast 2 – les changements environnementaux pré-Quaternaires**. Oral presentation. 09/2023

Response of biomineralizing marine phytoplankton to environmental changes in the Mediterranean Sea over the last decade: insights from high-throughput automated workflows. **ASLO 2023 Aquatic Sciences Meeting.** Oral presentation. 06/2023

Response of marine nannoplankton to environmental forcings: insights from automated imaging methods on community shifts in the Gulf of Lions over the last decade. **International Nannoplankton Association Meeting.** Poster presentation. 09/2022

Isotopic response of Pleistocene coccoliths to an ambient pCO_2 change: a calibration experiment. **International Nannoplankton Association Meeting.** Oral presentation. 09/2022

Reconstruction des pCO_2 atmosphériques quaternaires par la géochimie des coccolithes. **Réunion des sciences de la terre 2021**. Oral presentation. 11/2021

Probing the use of coccolith vital effects as a proxy for past carbon dioxide concentrations – Insights from Termination II in the Northern Atlantic Ocean. **Goldschmidt Virtual 2021.** Oral presentation. 07/2021

FUNDING

- **Projects funded (as P.I.)**

2024-2025 – Microfluidics and Micromanipulation Project (MiMi) – 6000 euros

2023-2024 – Financial support for a 2-month visit at IMARPE (Peru) – 6500 euros

2023-2025 – DEEP-UP project (Deep learning applied to Phytoplankton from the Peruvian Upwelling) – 2 year salary

GRANTS

2022 – Recipient of the City of Marseille's grant for young researchers

SCIENTIFIC OUTREACH

Speaker at the "Fête de la Science" at CEREGE – led a workshop on sediment cores for primary school students (2023).

Regular participant in awareness-raising activities for middle and high school students about careers in scientific research (2022-2025).

OTHER SCIENTIFIC ACTIVITIES

Reviewer for peer-reviewed scientific journals: Elsevier (*Geochimica et Cosmochimica Acta, AI in Geosciences*), Springer Nature (*Geo-Marine Letters*)

Convener for the "Evolution and Ecology" session at the International Nannoplankton Association Meeting (INA18, 2022)

SKILLS

Micropaleontology: Taxonomy of coccoliths and diatoms, sample preparation from marine bio-carbonates for chemical analyses and automated imaging.

Deep learning: Development of an image processing workflow (annotation, detection, classification) for various phytoplankton groups.

Geochemical analyses: Stable isotope chemistry ($\delta^{18}O$, $\delta^{13}C$) of carbonates, Inorganic geochemistry of Major, Trace and Rare Earth Elements using LA-ICP-MS, XRF, Optical and SEM cathodoluminescence, EPMA, and CHNS combustion analyses

Cell culture experiments: Coccolithophore culturing techniques including medium preparation, cell acclimation and monitoring of population growth rates and sizes.

GIS: ArcGis, Ocean Data View

IT: Data, spatial information, and timeseries analyses using R, Python, and Microsoft Excel

Languages: Fluent French and English (TOEFL iBT 117/120 in 2018); Basic Spanish