

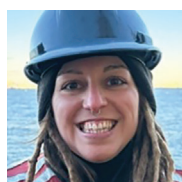
Meet the Authors



Karim Benzerara is a Director of Research at the French National Centre for Scientific Research (CNRS), based at the Institut de Minéralogie, Physique des Matériaux et Cosmochimie (Sorbonne Université and Muséum National d'Histoire Naturelle) in Paris. His research focuses on microbe–mineral interactions, with a particular emphasis on biomineralisation, using electron and X-ray microscopy, fieldwork, microbiology and experimental modelling. He has studied the formation of intracellular amorphous carbonate in cyanobacteria (Calcyan ERC grant). He has served as Treasurer of the European Association of Geochemistry (EAG) and is a Fellow of the Mineralogical Society of America, the Geochemical Society, and the EAG.



Tomaso R.R. Bontognali is a geobiologist affiliated with the Space Exploration Institute in Neuchâtel and the University of Basel in Switzerland. For years, he has studied microbe–mineral interactions to characterise morphological and geochemical biosignatures relevant to investigating early life on Earth and searching for life on other planets. He is part of the science team for the ExoMars Rosalind Franklin Rover Mission, which will be launched to Mars to search for traces of past extraterrestrial life.



Sylvie Bruggmann is a geochemist at the University of Lausanne, Switzerland, developing paleoenvironmental proxies based on trace metals and their isotopes. She earned her PhD from the University of Copenhagen, Denmark, where she focused on the complexities of non-traditional isotope systems. During her postdoctoral research at Rutgers University (USA) and the Vrije Universiteit Amsterdam (the Netherlands), she investigated the strengths and challenges of various metal isotope systems across a range of geological archives. Sylvie's research aims to uncover the environmental signals recorded by these isotope systems at the time of deposition and to assess how faithfully these signals are preserved in the geological record.



Jeanne Caumartin is a postdoctoral researcher in the Institut des sciences de la Terre, Faculté des géosciences et de l'environnement, at the University of Lausanne (UNIL), Switzerland. She studies the geochemical conditions that enable the formation of microbialites, with a current focus on understanding the sulfur cycle in Precambrian stromatolites, using mineralogical, synchrotron, and isotopic tools. She received the 2025 Haüy-Lacroix award from the Société Française de Minéralogie et de Cristallographie (SFM).



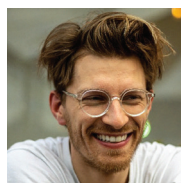
Christophe Dupraz is an associate professor of geomicrobiology at Stockholm University, Sweden, in the Department of Geological Sciences and the IGV Geochemistry Group, and serves as a board member of the University Astrobiology Centre. He earned his PhD from the University of Fribourg, Switzerland, on the paleoecology of reefal facies, followed by a postdoctoral fellowship at the University of Miami, USA. After research positions at the universities of Neuchâtel and Lausanne in Switzerland, he joined the University of Connecticut in the USA. His research integrates carbonate sedimentology, biogeochemistry, and microbial ecology to investigate organo-mineralisation in modern and ancient microbialites, extending to prebiotic Earth conditions and the origin of life.



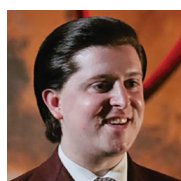
Laurane Fogret is a postdoctoral researcher at the Naturalis Biodiversity Center in the Netherlands. Her work focuses on the co-evolution of life and Earth's surface environments, with a specialisation in the field-based recognition and interpretation of stromatolites. By integrating detailed textural observations with elemental and isotopic geochemistry, she investigates the mechanisms of carbonate precipitation and the preservation of biological signatures in the geological record. Her work aims to decipher the complex chemical and microbial signals that define these ancient archives of life.



Purificación López-García is a Research Director at the Centre National de la Recherche Scientifique (CNRS) in France. She studies the diversity, ecology, and evolution of microorganisms across the three domains of life (archaea, bacteria, and eukaryotes) in little-explored and often extreme natural ecosystems, using a wide range of classical and molecular tools, including metabarcoding, (meta)genomics, and phylogenomics. She pays particular attention to broad questions concerning the origin and early evolution of life on Earth, with a special focus on microbial lineages, which represent the vast majority of biological diversity.



Robin Havas is a postdoctoral researcher at the Université d'Aix-Marseille, France, specialising in isotope geochemistry and sedimentology. His research reconstructs ancient Earth surface environments, focusing on the evolution of life and its interactions with the geosphere. He emphasises modern analogues like redox-stratified lakes, which offer insights into the past. Using fieldwork, lab experiments, and modelling, he studies how biological and abiotic processes are recorded as mineralogical and geochemical signatures, and how these signals may change during diagenesis. He also investigates microbialites, both modern and ancient, as archives of ecological and climatic information.



Keyron Hickman-Lewis is a microbial palaeontologist at Birkbeck, University of London, UK. He is interested in the co-evolution of Earth and life throughout the Precambrian, the interdisciplinary application of advanced analytical techniques to understand biosignature preservation over billions of years, and the astrobiological exploration of Mars. He is a Returned Sample Science Participating Scientist on the NASA Mars 2020 Perseverance rover mission and a Guest Investigator on the ESA ExoMars rover mission.

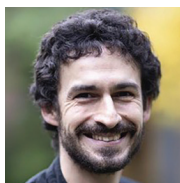


Axel Hofmann graduated from the University of Mainz in Germany and investigates the Archean geological record preserved in granitoid-greenstone terrains and sedimentary basins. His main interests lie in applying geological subdisciplines, including structural field mapping, sedimentology, and trace-element and stable-isotope geochemistry, to understand Archean surface processes, early life, and mineral deposits. He has been researching and lecturing at the universities of Zimbabwe, Witwatersrand, and KwaZulu-Natal in southern Africa, has been a visiting professor in France and India, and is currently a professor in the Department of Geology at the University of Johannesburg, South Africa.



Simon V. Hohl is an associate professor at the State Key Laboratory of Marine Geology at Tongji University, Shanghai, China, where he studies modern and past aquatic environments. He uses a wide array of stable metal-isotope systematics and novel in situ laser-ablation trace-metal mapping methodologies to investigate the intricate relationships between metal cycling in microbial habitats and carbonate formation.

His Tongji Carbonate Geochemistry group has developed and refined Mg, Ni, Cd, and Ba isotope methodologies to study nutrient availability and biogeochemical metal cycling in the photic zone through deep time, and is building the Stromatolite Geochemical Archive.



Miguel Iniesto is an assistant professor of microbial ecology at the University of Paris-Saclay, France, specialising in characterising microbial communities from natural, understudied, and often extreme ecosystems. He is also interested in understanding the processes that enable the formation of modern microbialites—living analogues of the earliest ecosystems found in the fossil record, dating back up to 3.5 billion years.

His fascination with the link between microorganisms and fossils has also led him to participate in various projects aimed at understanding the formation of exceptional fossils.



Johanna Marin-Carbone is a professor of geochemistry at the Université de Lausanne, Switzerland, specialising in stable isotopes and mineralogy to elucidate the environmental conditions of early Earth. She is reconstructing Precambrian Ocean temperatures, investigating Archean biosignatures, and deciphering the environmental conditions that prevailed during the early history of our planet.

She combines mineralogical analyses with spatially resolved isotope analyses at the micrometer scale to determine primary signals serving as proxies for ancient metabolic functions or environmental conditions. Through this integrated methodology, she distinguishes genuine biosignatures from secondary alteration processes, providing crucial insights into the earliest life-supporting environments on Earth.



Anna Molekwa completed her MSc at the University of Johannesburg, South Africa, focusing on the origin of granular chert in the c. 3.4 Ga Buck Reef Chert of the Barberton Greenstone Belt, South Africa. She is currently an NRF-funded PhD student at the University of the Witwatersrand, South Africa. Her research focuses on the Neoproterozoic Campbellrand Group of the Transvaal Supergroup, examining the processes that influenced the formation and diagenesis of stromatolitic carbonates.

In pursuit of her academic career, she is an instrument scientist in the LA-ICP-MS lab at the University of Johannesburg.



David Moreira, a Research Director at the Centre National de la Recherche Scientifique (CNRS) in France, has focused his research on understanding the diversity and evolution of microorganisms across the three domains of life, aiming to reconstruct their phylogeny and elucidate how their genomes evolve. More recently, he has also become

interested in evolutionary relationships not only among living organisms (cells)—a line of research that led to the description of the first species of *Vampirococcus*, an epibiotic bacterial parasite—but also between living cells and non-living entities such as viruses.



Indrani Mukherjee is a lecturer and researcher in Earth sciences at the University of New South Wales (UNSW), UK. Her research focuses on deep-time geology, examining ancient marine environments using novel, cutting-edge in situ geochemical techniques. Her research questions explore links between early Earth evolution, the origin of

complex life, and the formation of economic mineral deposits. She completed her BSc and Masters degrees at the University of Delhi, India. She completed her PhD at the University of Tasmania, Australia, in 2018, where she worked as a lecturer and postdoc until 2022. She then pursued the Roger E. Deane Fellowship at the University of Toronto, Canada before joining UNSW.



Frantz Ossa Ossa completed his PhD in Earth and planetary sciences at the University of Poitiers, France. Following his graduation, he was an NRF-funded postdoc at the University of Johannesburg, South Africa, and then a DFG-funded postdoc in the Isotope Geochemistry Group at University of Tübingen, Germany. Before joining

Khalifa University (UAE) as an assistant professor in the Department of Earth Science, he was a NERC-UKRI-funded Research Associate at the School of Earth and Environmental Sciences, Cardiff University, UK, and a Guest Investigator at Woods Hole Oceanographic Institution, USA. His research interests include astrobiology, paleoclimate, paleoceanography, paleoecology, biogeochemical cycles, and economic and petroleum geology.



Alice Pellerin is a PhD candidate at the Université Bourgogne Europe in France, exploring the redox transition in Archean oceans. She aims to gain insights into the timing, modes, and drivers of oceanic oxygenation by using nitrogen isotopes serving as a proxy for the ocean's redox state and the joint evolution of the biosphere. Her work

confirms that nitrogen isotopes provide a powerful tool for recording both global ocean oxygenation and local biological processes, and identifies gaps in current interpretations of the nitrogen isotope signature, proposing a framework that incorporates lithology, metamorphism and carbon isotopes to guide future interpretations of paleoenvironmental oxygenation.



Pierre Sans-Jofre is an associate professor in the Department of Origins and Evolution at the National Museum of Natural History in Paris, France. He is a geochemist and geobiologist who studies the coevolution of Earth and its biosphere over geological time, seeking traces of life in ancient rocks. His research examines how life has shaped

our planet's surface and how Earth's turbulent geological history has influenced the evolution of life.



Christophe Thomazo is a professor of geochemistry at the Université Bourgogne Europe in France. His research focuses on the co-evolution of life and Earth's early environments, particularly during the Archean. His work integrates isotope geochemistry and biogeochemical cycling to investigate interactions between life and the geosphere. Key themes

include the role of microbial carbon, nitrogen, and sulphur metabolisms in shaping early Earth's redox states, combining field observations, laboratory experiments, and modelling to decipher biosignatures. A distinctive aspect of his approach is the use of modern sedimentary analogues to better constrain transfer functions for biosignatures from the biosphere to the geological record.



Sebastian Viehmann is a low-temperature geochemist at Leibniz University Hannover, Germany, specialising in trace elements and their novel stable and radiogenic isotope systems. He aims to reconstruct the co-evolution and interaction of the oceans, continents, atmosphere, and life from the early Earth to the present. He obtained his PhD from Jacobs University Bremen, Germany, where he investigated the timing of continental emergence and the sources affecting Precambrian seawater. As a postdoctoral researcher at the University of Vienna, Austria, he expanded this work and applied the geochemical toolbox, targeting stromatolitic carbonates to reconstruct microbial habitats and metal cycling within (ancient) microbial mats.



Pieter Visscher is a marine sciences professor at the University of Connecticut, USA, with joint roles in Earth Sciences and Molecular and Cell Biology. A Fellow of the Geological Society of America, he collaborates internationally with Curtin University in Perth, Australia, and China University of Geosciences in Wuhan. He earned his PhD from the University of Groningen in the Netherlands, specialising in geochemistry and microbial ecophysiology related to sulphur cycling. His trace-gas biogeochemistry expertise was honed during postdoctoral fellowships at the University of Miami, USA, and as a research associate at the USGS. He is a founding member of NASA's Astrobiology Institute, studying biosignatures in microbialites.



Nina Zeyen is an assistant professor of biogeochemistry in the Earth Sciences department at the University of Geneva, Switzerland. Prior to joining UNIGE in 2022, she was a postdoctoral researcher in the Department of Earth and Atmospheric Sciences at the University of Alberta (Canada), where she worked on mineral carbonation using kimberlites from the mining industry. Her current research primarily focuses on the formation of modern microbialites across various lacustrine environments, particularly the early stages of mineral formation and early diagenetic transformations.

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