# Spotlight on... Dr. Lucien Nana Yobo

*written by Maya Pincus (USSSP)*

Credit: Lucien Nana Yobo

There may be no one better equipped to tell the story of Earth's history than Dr. Lucien Nana Yobo. In his historical geology class, which he teaches to non-geology majors, he likens the Earth to Pride and Prejudice. While the latter is "the greatest love story of all time," the former is equally, if not more, dynamic, and through preservation in the rock record, is equally available to those who wish to follow its exposition.

As someone who researches catastrophic events and critical turning points in the Earth system, Lucien knows a thing or two about storytelling. He primarily identifies as an isotope geochemist, but will admit to being a stratigrapher as well. From his years of experience, he knows that "a lot of people focus on these critical intervals, but for us to really understand these big critical events, we have to look at three, four, five, million years leading up to this event." Enter ocean drilling.

Lucien started working with IODP samples when he was a doctoral student at the University of Houston. This wasn't his first exposure to scientific ocean drilling—one of his undergraduate professors from California State University, Fresno was absent for half a semester due to being at sea—but his research didn't bring him to the cores until he became interested in oceanic anoxic events. Specifically, he was interested in historical scientific ocean drilling in the Pacific, expeditions carried out on the Glomar Challenger by the Deep Sea Drilling Project. These core samples became Lucien's impetus: He was eager to get his hands on them to conduct his own investigations, but "of course, I wasn't able to get any material from this interval because they're old, they are critical, and a lot of it was depleted [by other scientists] so there is a not a lot left." Instead, he relied on the literature. But the more he read old reports from those expeditions, he "got more and more interested in core materials."

Lucien's had his first experience at sea as a geochemist during Expedition 397 (Credit: Sandra Herrman & IODP JRSO).

LEFT: Lucien enjoys a *JOIDES Resolution* Sunday barbecue with members of the Expedition 397 science party (Credit: Sandra Herrmann & IODP JRSO). RIGHT: Adhering to tradition, Lucien stands on the catwalk ready to receive the last core of Expedition 397 (Credit: Kevin Grigar & IODP JRSO).

Looking back to his childhood, this fascination with Earth's geological history and cataclysmic events is no surprise. In fact, Lucien always knew he would grow up to be a geologist. His life began in Cameroon, alongside an active volcano that would erupt often enough that the consequences were disastrous. From witnessing these events with such frequency, he says, "I was intrigued to become a geologist." And it wasn't just volcanoes. "I learned about killer lakes as well in high school, the outgassing, these catastrophic events…" It's almost as though the decision to study geology was made for him.

Fast forward to the present, Lucien has been involved in not one but two expeditions. He participated in Expedition 392: Agulhas Plateau Paleoclimate as a shore-based scientist, and went to sea aboard the *JOIDES Resolution* with Expedition 397: Iberian Margin Paleoclimate. You can tell from the names of these expeditions that Lucien has a theme. He is fascinated not just by "catastrophic events," but by the changing global conditions that lead to the tipping points that force the events.

To interrogate Earth's past and reconstruct paleoclimate, Lucien employs isotope geochemistry. He primarily measures metal isotopes like calcium, strontium, and neodymium, but he also spends time analyzing other "non-traditional" isotopes like osmium. These chemical tracers help him uncover hints of Earth's volcanic past, and how these dynamic events can potentially lead to oceanic anoxia. He is trying to answer the questions: How did the anoxia grow? How did it develop? How were oceans able to recover? A large volcanic eruption is just one hypothesis.

Lucien does not solely focus on the oceanic anoxic events; he also considers other critical times in Earth's paleoclimate history such as the Paleocene-Eocene Thermal Maximum (PETM). By applying osmium isotope geochemistry to both of these periods in Earth's history, Lucien is attempting to understand not just the events themselves, but how scientists can best perform isotopic analyses to learn more about other changes in Earth's past. For example, the PETM is still poorly understood in terms of what caused it, but it is one of the closest to modern catastrophic climate events in Earth's timeline.

This comparison between events allows Lucien to "expand applications of [the osmium] isotope system," because it accounts for the "patchwork" nature of ocean sediment cores. When comparing one section to the next, across holes and drilling sites, it becomes difficult to calibrate age models and constraints,

making it challenging to identify and understand inflection points in the record. His goal is to develop an osmium isotope record for the global oceans, so that future scientists can apply these systems to better understand Earth's chaotic past. His greatest ambition is that he and his students "make major contributions to understanding Earth system processes."

While Lucien's methods and research interests are not uncommon among paleoclimatists, his motivations are what make him stand out. When he reflects on his work, his focus is not necessarily on the catastrophic events themselves, but what they signify for Earth and humanity. "In our solar system we're unique," Lucien reminded me. "We are a habitable planet, and we would like to keep it so." As he focuses on periods in Earth's past when the planet grew inhospitable, he can't help but dwell on what those times can tell us as Earth grows increasingly inhospitable today. The only difference is our role. He explains passionately: "Someone might wonder, 'Oh, why are you obsessed with inflection points and when things exactly happened?' I mean, the reason is because we live on a dynamic planet, and this planet has seen a lot of things. We are moving to a time where we expect some catastrophic events are about to happen—how soon are they going to happen? We have no idea. But if we can understand a lot about how these events have happened in the past and how the Earth system recovered from them, then it can give us better ideas in terms of remediation strategies."

As much as these past climates might be analogies for modern climate change, Lucien is insistent that humans are now an important factor. On top of our part in changing conditions, he is cognizant of the fact that we will be greatly affected by whatever happens. "Our planet has gone through a lot of things, and has always recovered from it. But now we are here, that's different." And it's not just about how our own experiences will change: "We just have that responsibility to see that we are good stewards and that in the next billion years, the next people who are going to inhabit Earth are going to have a good place to call home."

This urgent research is just one of the many means by which Lucien occupies his time. As an Assistant Professor at Texas A&M University, he teaches several classes in addition to historical geology, such as isotope geochemistry for undergraduate students, radiogenic isotope geochemistry for graduate students, and special topics graduate seminars. He makes a point to bring his students to the Gulf Coast Repository each semester so that they can see for themselves "what all these cores look like, and all the stories, and how we've been able to piece together these stories." Lucien has found that the experience is "eye-opening" for many of his students, as it is their first exposure to the samples that make so much research possible.

Lucien also volunteers a significant portion of his time to service in the community, for example by serving as a reviewer and as an early career director on the board of the Geochemical Society. Just last summer, he was one of the leaders of the Establishing Early-Career Scientific Ocean Drilling Learning Communities workshop, aimed at welcoming expansive participation in the scientific oceans drilling community and providing training to help participants leverage existing legacy assets. He and the other workshop organizers were motivated to create an inclusive and productive environment to counter the "hidden curriculum, things like 'I don't know, no one ever told me that' but people expect that you should know."

For someone who "never really envisioned that I was going to end up as a professor," Lucien has come a long way. What he loves most about his job is "the ability to think about being able to do things, sometimes things that have never been done, and trying to use applications of things that we know really well and try to apply them differently in Earth's history." It's clear that he is not only making strides in his research into our dynamic planet, but also in the support of a connected and supported community of researchers excited about this science.