

# **Navigating industry-academia Collaboration in Critical Mineral Research as a Graduate Student**

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Graduate research is a gateway to hands-on experience in collaboration with various stakeholders. Student researchers are allowed a platform to develop independent research and project management skills through active engagement with industry partners, policymakers, and the general public. Such intermingling not only helps to brainstorm research questions of social relevance but also delivers research output that is useful to the global community. Industry-academic research in geology would facilitate growth in interdisciplinary themes of sustainable energy that will add value to society's changing energy landscape. To meet the rising demand for research and development in sectors such as geothermal energy, critical elements, and carbon sequestration, there is an immediate need for a greater overlap between the hydrocarbon and mining sectors and geoscientists. The benefits of such collaboration are manifold. First, it fosters a learning environment for early-career scientists looking to contribute to scientific knowledge with a tangible output. Secondly, generous industry funding allows better access to expensive quantitative analyses. Thirdly, accountability to industry collaborators demands meeting industry standards while meeting well-defined project goals. Additionally, industries can take into consideration key research findings before making crucial business decisions, thereby ensuring better allocation of economic resources.

My Ph.D. dissertation is a result of industry-academia collaboration. I was interested in investigating the potential of critical elements such as rare earth elements (REE) and lithium in organic-rich black shales. However, the questions I wanted to address required performing geochemical experiments on samples derived from oil and gas-producing plays. That became possible with the timely involvement of Coterra Energy Inc. who provided samples, funding, and exchanged proprietary information necessary to propel the work. The experiments were conducted in the IsoBiogeM Lab at West Virginia University, under the supervision of my academic advisor, Dr. Shikha Sharma. We found interesting associations of REE and lithium with shale minerals and organic matter. Without the industry partnership, the interpretations from geochemical analyses would have been incomplete and not pushed the envelope in critical element exploration. The collaboration has not only benefitted me professionally but has also taught me that knowledge sharing is key to driving innovation in scientific research.