Council on Undergraduate Research – Geosciences Division

2021 GeoCUR Award For Excellence in Student Research

Hanna Szydlowski, Grand Valley State University

Geology, Nominated by: Dr. Patrick Colgan

Hanna Szydlowski is currently a junior at Grand Valley State University (GVSU) working on her B.S. degree in geochemistry. Hanna is recognized by the GVSU Geology Department faculty for her exemplary research project where she tests multiple hypotheses of groundwater aquifer size and travel time using stable isotopes. Hanna monitored groundwater levels and gradients, and stream stage in three small spring-fed streams in Michigan; and she collected weekly water samples of precipitation and small spring-fed streams for one year. Water samples were analyzed for O and H isotope ratios at an external laboratory. Hanna then analyzed the data to test two alternative hypotheses of aquifer size, travel time, and mixing rates. Hanna presented her preliminary results at the October 2020 online "Annual Meeting of the Geological Society of America" and won an award for best undergraduate poster from the Hydrogeology Division. Her poster is titled, "Preliminary stable isotope and piezometer data suggest a rapid response of spring discharge to seasonal recharge in a shallow sandy aquifer, Ottawa County, Michigan". Her faculty mentors are Ian Winkelstern and Patrick Colgan, and her research is supported by two internal grants from GVSU. Hanna has also presented her research at two different undergraduate research events at GVSU, one in September 2020, and more recently in April 2021. Besides being an excellent researcher, Hanna is also an excellent and energetic student and a positive force in the department where she works part-time in helping to set up labs and organize our collection of teaching materials.

Zoe Lacey, Trinity University

Geological Sciences, Nominated by: Dr. Brian Ziegler

I am pleased to nominate Zoe Lacey (Trinity University Class of 2021) for the GeoCUR Award for Excellence in Student Research. Since Spring 2020, Zoe has developed a reactive transport model to describe the biogeochemical controls on the mobility of trace elements in an aquifer contaminated by crude oil. For her research, Zoe created a new model framework for describing how carbonate minerals can adsorb trace elements in aquifer environments. While this phenomenon has been documented in the laboratory setting, its implementation in a field-based geochemical model is lacking. Therefore, Zoe did not have much of a framework in the literature to base her model on. Instead, she had to create it herself, which demonstrated ingenuity, perseverance, sophisticated knowledge of (bio)geochemistry, and advanced coding skills. Her modeling results validated an important hypothesis about trace element cycling in contaminated aquifers: positively charged trace elements, like nickel and cobalt, can be removed from groundwater by adsorption to carbonate minerals, which can form close to the contaminant source. However, negatively charged trace elements, like multiple forms of arsenic, cannot sorb to carbonate minerals, and generally are transported further in groundwater, leading to more widespread groundwater contamination by negatively charged elements. Her results have been shared at the South-Central Geological Society of America Meeting and have culminated in a senior thesis that will be submitted to a peer-reviewed journal for publication. Zoe's results are applicable to hundreds-of-thousands of aquifers contaminated by organic carbon and suggest novel geochemical approaches for remediating trace elements in groundwater.