

## **Promoting Undergraduate Research Opportunities and Undergraduate Professional Development in the Department of Geological Sciences**

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### **Summary**

This project was aimed at enhancing undergraduate research opportunities and undergraduate professional development in the Department of Geological Sciences. This was accomplished in two primary ways. First, an “Undergraduate Researcher Guide” was developed for undergraduates starting work in the CU ThermoChronology Research and Instrumentation Lab (TRaIL), the lab that Flowers directs, with the aim of providing a clear path for students from the start of their research positions through possible completion of honors theses. Second, a plan was devised to incorporate several new professional development activities into the GEOL undergraduate major gateway course of *Earth Materials* (GEOL 2005).

These activities are linked in that many TRaIL undergraduate researchers initially meet Flowers when enrolled in her *Earth Materials* class. For example, all four undergraduates who completed honors theses in TRaIL in spring 2020 took this class taught by Flowers. Moreover, the three recent TRaIL undergraduates who were awarded NSF Graduate Research Fellowships, one each in 2020, 2019, and 2018, were either initially recruited by Flowers out of her *Earth Materials* course to begin lab positions (Coleman Hiatt, class of 2017; Ryan Stoner, class of 2016) or served as a Peer Learning Assistant for this class (Spencer Zeigler, class of 2019, now beginning a PhD with Flowers). In addition, TRaIL’s support of GEOL undergraduates has been an important broader impact element in TRaIL’s three successful NSF Instrumentation and Facilities proposals, which have built the lab’s instrumentation almost entirely with external funding. Flowers therefore sees much value in efforts to further enhance synergies among teaching, research, and laboratory activities at CU. These experiences provided the motivation for this ASSETT project.

### **TRaIL Undergraduate Researcher Guide**

Flowers developed an “Undergraduate Researcher Guide” for TRaIL to further enhance the experiences of undergraduates working in the lab. Much of the direct undergraduate mentorship in TRaIL is provided by graduate students, postdocs, or other departmental researchers. For example, we have a longstanding collaborative relationship with Dr. Lon Abbott, who runs the GEOL undergraduate research seminar, and who commonly mentors a cohort of undergraduates in our lab. As TRaIL has grown, we have been able to provide a greater number of undergraduate opportunities.

Although we feel that we have a relatively effective system for undergraduate mentorship from the start of projects through data acquisition, over the last year Flowers began recognizing the need for improved undergraduate support at the data interpretation stage. This need has grown as

more TRaIL undergraduates have begun presenting their work at national meetings and completing honors theses. The new “TRaIL Undergraduate Researcher Guide” is largely aimed at meeting this need. While the first part of the Guide provides a general introduction to new researchers in the lab, the majority is aimed at providing data interpretational support. The Guide includes a brief statement on TRaIL’s philosophy on undergraduate research projects, suggested background reading, a data explanation, suggested steps for data compilation, data quality evaluation, and data plotting, and information on data interpretation and honors thesis completion.

The current version of the Guide is included with the submission of this ASSETT report. Flowers is in the middle of obtaining additional feedback on it from a suite of recent TRaIL undergraduates, and plans to revise it further based on their input.

### **Professional Development Activities to be Implemented in GEOL 2005, Earth Materials**

Flowers hopes to implement one or more new professional activities in her *Earth Materials* class in Spring 2021. This may include a “Strengths Quest test” and a session on developing digital identities, website development in WordPress, and considerations in professional portfolio development. Flowers hopes to work with Amanda McAndrew on these elements.

Flowers teaches an undergraduate writing class, which already includes some professional development components. Her initial vision for her ASSETT project was to develop a 1-credit undergraduate professional development class, but given her existing teaching commitments it is not currently realistic for her to fully develop and teach such a class. The components proposed above are topics with which she has far less familiarity and has never used in any class. Developing these new pieces within the framework of *Earth Materials* will contribute to the longer-term goal of implementing a stand-alone undergraduate professional development class in the future.

### **Concluding Statement**

This ASSETT project was aimed at further developing the synergistic links among undergraduate teaching, research, and laboratory activities. The funds from this ASSETT professional development award will be used to help cover analytical costs associated with projects of a rising crop of undergraduate researchers in TRaIL. The new TRaIL Undergraduate Research Guide may be of value to other labs more recently established in the Department. The new undergraduate professional development activities implemented in *Earth Materials* will be made available to all sections taught of this course.