LAURISSA MARCOTTE
Faculty Mentor: Dr. Emily Arnold
Title: Characterizing the Electromagnetic Properties of Fiberglass/Epoxy Composite Materials

Abstract: Fiberglass/epoxy composite materials have many useful structural applications on modern aircraft because of their high strength-to-weight ratios and because their structural properties can be easily manipulated. The dielectric properties of fiberglass composites also allow them to be utilized alongside radar equipment, such as the airborne remote sensing systems employed by CReSIS.

The order and orientations of the plies in a composite layup, also called the layup’s stacking sequence, rely on the strength requirements of the component being built. The effect of the stacking sequence on the dielectric properties of fiberglass composite materials is unknown. This study proposes to investigate the effects of a stacking sequence on the dielectric constants of fiberglass/epoxy composite materials similar to those utilized by CReSIS.

AUSTIN FEATHERS
Faculty Mentor: Dr. Stephen Yan
Title: Conformal Dual-Band HF Radar Antenna System Design for Implementation on a Small UAS

Abstract: High-frequency synthetic aperture radar (HF SAR) soundings from an aerial platform provide an effective method for sensing ice sheet basal topography. However, large manned aircraft are expensive to operate and introduce both risk to the crew and pilot error in sounding measurements. Small unmanned aerial systems provide safe and inexpensive platforms for this radar equipment, necessitating the development of a miniaturized dual-band, wide-band HF/VHF dipole antenna system. This system must also be implemented conformally to the surface of the aircraft to maintain the platform’s aerodynamic properties and avoid changes to antenna geometry during flight. Metalization of the non-conductive aircraft surface, primarily wing surface, will be used to produce the antenna elements.

ABBey WHISLER
Faculty Mentor: Dr. John Paden
Title: A Graphical User Interface and Database Management System for Documenting Glacial Landmarks

Abstract: The Landmarks Tool is a new feature in the CReSIS Data Picking Graphical User Interface that allows users to mark landmarks in the echogram window with a rectangle and save the segment number, GPS times, two way travel times, and description of the feature directly to CReSIS’ database. Before this tool was created, if users wished to record any landmarks observed in the echogram, they would manually make a note in an external piece of software, like a shared spreadsheet. The landmark tool will be faster and more precise than this method because it saves the exact GPS time and two way travel time of the landmark to the database automatically. It will also allow data users to query landmarks from the database using geospatial information. This tool requires new Python/Django scripts that can handle and store the landmark data in a PostgreSQL table and matlab code to construct a graphical user interface that can accept user input and call the aPython/Django scripts.

JENNAH SEAVER
Faculty Mentor: Cheri Hamilton
Title: Analyzing the Efficacy of the Addition of a Survival Unit

Abstract: Ice, Ice, Baby! is a science program developed by the education team at the Center for Remote Sensing of Ice Sheets (CReSIS). The inquiry-based, hands-on activities built into the program are designed to help students understand the dynamics of polar ice sheets and sea level rise on a basic level. Ice, Ice, Baby! lessons not only give educators an opportunity to expand the environmental awareness of their students, they also serve as platforms for the teaching of scientific principles to fulfill the Next Generation Science Standards (NGSS). The “survival unit” of Ice, Ice, Baby! is an effective component of the program, because rather than limiting lessons to the physical terrain, it instead focuses lessons on the people involved in it. This serves as a relatable topic that may stimulate interest and creativity among youth, potentially increasing productivity. Lessons involve why explorers must develop awareness of and solutions for hazards such as ice thickness, frigid temperatures, and food scarcity. The lessons associated with these topics are designed to be inquiry-based, hands-on, and appropriate for the NGSS standards for school districts.