

## **Maple Scholars Faculty Proposal (Summer 2024)**

Short title: **Propolis Antimicrobial Properties**

Full title: **Exploration of the Antimicrobial Potential of Honey Bee (*Apis mellifera*) Propolis**

**Dr. Andrew Ammons, Biological Sciences Department**

### **“Exploration of Honey Bee Propolis as Antimicrobial” Description:**

Propolis is a substance produced by honey bees and some other bees for colony defense and maintenance of hive immunity; however, much of our current understanding of the role of propolis and its properties is limited. Much of the scientific research on propolis has occurred in recent years, but these studies and older anecdotal traditional knowledge have indicated that propolis has possible health benefits in humans.

Propolis is a mix of tree resin and sap in the majority, and honey bee saliva and pollen in the minority. Its composition varies based on time of year and location of bee colonies. Honey bee colonies are known to use propolis as “bee glue” to hold together certain parts of the hive and to fill in small gaps in the exterior of the hive (as a barrier to entry to predators/parasites, restrict an entryway, or to improve the ability to retain heat in the hive).

Research over the last century has also revealed that propolis helps a bee colony to maintain “hive immunity.” As in honey, royal jelly, and beeswax, the chemical and physical properties of propolis (low pH, certain chemicals, botanical compounds) have been attested to have antimicrobial or antibiotic effects. In fact, the honey bee genome is lacking in some basic immune-related genes found in relatives like flies and mosquitoes. The colony-living bees are thought to have evolved behaviors and substances like propolis that make up for this lack in basic immune function.

The Maple Scholar for this project will assist in the attempt to harvest, refine, and test the antimicrobial properties (against bacteria, molds, and fungi) of propolis from our Goshen College honey bee colonies.

For this project, the student will be expected to participate in the laboratory elements of research as well as become adept at honey bee hive inspection, management, and observation in the apiary. In addition, the Maple Scholar will learn how to quantify propolis and test for antimicrobial properties using various microbiological techniques (such as Kirby-Bauer antibiotic testing in agar plates). Other skills to be practiced might include taking measurements of propolis samples (chemical, botanical, protein content, *etc.*), compound and dissecting microscopy, and assisting the principal investigator with apiary maintenance.

### **Student and Investigator Expectations:**

**Student enthusiasm, self-motivation, independence as a researcher, and commitment to the project are a major factor in selecting Maple Scholar**

**finalists.**

**The principal investigator's hopes and goals for the summer** would be to have a student engage in active research, design their own experiments with guidance, and learn how to present research in a professional format.

**Student applicants** would be aided by some biology or science background (appropriate for first or second year Biology majors), but this is not necessary for applying. Attendance at informal journal clubs will be necessary for the student to train in the interpretation of scientific publications.

**The anticipated results from summer research for the participant** would be the completion of an independent research project. This project would be suitable for presentation at local or national scientific conferences. All scholars are also asked to write a research paper using the guidelines of the National Conference on Undergraduate Research.

### References

- Braakhuis, A. (2019) *Evidence on the health benefits of supplemental propolis*. *Nutrients*; 11:11, 2705.**
- Hölldobler, B. and E. O. Wilson. 2008. *The Superorganism: The Beauty, Elegance, and Strangeness of Insect Societies*. New York: W. W. Norton & Company.**

**Maple Scholars Proposal for Summer 2024**

**Utilizing the Social Determinants of Health as a Framework for Student Support and Success at Goshen College**

**Emily Hahn, Student Life Adjunct Sociology Professor**

**Description:**

Social determinants of health (SDOH) are the conditions in the environments where people live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks. SDOH can be grouped into five domains: Economic Stability; Education Access and Quality; Health Care Access and Quality; Neighborhood and Built Environment; and Social and Community Context. ([Source](#))

Goshen College students come from a wide variety of demographic backgrounds, including socioeconomic status, race, ethnicity, religion, sexual orientation, gender identity, and citizenship, among others. Given the diverse identities and lived experiences within our community, Goshen College must implement policies and systems of support that address the social determinants of health.

When it comes to college students, these determinants can significantly impact their overall well-being and academic success. Implementing interventions and policies that consider factors such as income, education, housing stability, access to healthcare, and social support can lead to improved outcomes for individuals and communities, and college students are no different.

Addressing these social determinants of health is essential for creating a supportive and conducive environment for college students to thrive academically and personally. Initiatives that promote equity, access to resources, and a supportive campus culture can improve student health outcomes.

**How can Goshen College reduce the risk factors associated with the various SDOHs and maximize the protective factors to pursue the most equitable outcomes for our students?**

This Maple Scholars project aims to investigate existing literature on the impact of social determinants on the health and well-being of college students, focusing on identifying factors that may influence academic performance, mental health, and overall quality of life. Using sociological theories and concepts and public health models, students in this project will explore how Goshen College can leverage the SDOH as a framework for systems of student support.

**Background expected:**

Given the nature of this project, students with academic experience in Sociology and/or Public Health are best suited to thrive. Students should have at least moderate experience conducting literature reviews of existing research and best practices and be interested in creating policy and

procedural recommendations. Students in this project must demonstrate an openness to difficult questions and conversations that include topics such as identity, power, inequity, and privilege.

**Anticipated Results:**

By the end of this project, we will have conducted a comprehensive literature review of relevant research and propose models for further assessments, interventions, and policies.

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Students in the project will learn how to align theoretical frameworks and concepts with evidence-based, actionable steps from an interdisciplinary perspective. Goshen College will benefit from the compilation of this research and recommendations at a time when the social determinants of health are increasingly being incorporated as a best practice in a variety of fields.

## Game Theory

### Maple Scholars Proposal for Summer 2024

## **Game Theoretic Models of Power, Cooperation, and Resource Allocation**

### **David Housman, Mathematics and Computing**

#### **Description:**

The first veto by a United States President was against a bill apportioning congressional representatives to states. The United Nations Security Council passes measures by simple majority but five permanent members can veto any measure. Some European parliaments have representatives assigned based on votes for a political party. Some New York state county councils have members with weighted votes because they represent different numbers of constituents. How can voting power be defined and distributed fairly in these types of situations? After each decennial census, states must create districts of roughly equal population sizes for each representative. How can states avoid political gerrymandering of district boundaries?

Under what circumstances will self-interested individuals cooperate with other self-interested individuals? This is a central question underlying attempts by scholars to understand how cooperative behavior has evolved in humans and other organisms. One model that has been extensively studied has been repeated play of the two-player Prisoners' Dilemma game. How can this work be extended to other situations and more players?

By collaborating, several cities can save money on upgrading their water treatment facilities. What is a fair way of allocating the savings? Several people have inherited an estate, but they differ in their opinions about the worth of each item in the estate. What is a fair way of allocating the estate? Different sportswriters have different rankings for college football teams. What is a fair way of melding these different opinions into a single ranking? In these situations, do the agents involved have incentives for stating their true costs, valuations, or rankings?

Game theory is the mathematical study of scenarios of conflict and/or cooperation. In this research, students develop a mathematical model of a scenario, define fairness properties or rules of engagement, suggest solution concepts, determine solutions for their specific situation, and/or provide appropriate interpretations. Students may extend, modify, or rely on previous work done by students or results found in the mathematics, economics, biology, and political science literature, or students may begin with a totally new situation, model, properties, rules, or methods.

#### **Background Expected:**

A student participant should have the ability to read, critique, and write mathematical proofs. For some research areas, the student participant should have the ability to write computer programs to explore possibilities. Knowledge of an application area of interest would be beneficial.

**Anticipated Results:**

The primary goal is the development of the student's ability to undertake applied mathematical research and communicate their results to others. Students are expected to write a project report, offered opportunities to present their work at conferences, and offered the opportunity to turn their project report into a paper that could be submitted for publication.

## Goshen Spotlight

### **Maple Scholars Proposal for Summer 2024**

## **Goshen Spotlight Documentary**

### **Kyle Hufford, Communication Department**

#### **Description:**

##### BACKGROUND

The Goshen Spotlight project has provided students opportunities to not only explore their own discipline but experience a variety of disciplines across the college. This project has also provided a service and benefit to our local community by exploring local stories and history.

During the seven-year history of the project we have learned what works and what doesn't in our process to capture these stories. In 2015 we expanded our scope and diversity within our community to reach areas we had not before. We took a whole new approach to this project by creating new educational opportunities through a long format documentary that has had lasting power beyond Maple Scholars' summer term.

One fact remains over the course of the projects, there are an endless amount of heartwarming and intriguing stories in Goshen to be uncovered.

##### PROJECT SCOPE

I am proposing for this summer to research and create a short form single topic documentary. This was very successful the last two summers and opened avenues to expand this year. We will research topics prior to the summer and choose a story that is both uniquely Goshen and one that has received little attention up to this point. A short form documentary will allow the student to focus on one topic for the summer term and be immersed in the research and telling of a singular story. This year we will focus on a more current topic versus a historical one.

The length of the documentary will be between 10 and 15 minutes.

##### UNIQUE CREATIVE OPPORTUNITY

Local news outlets like Goshen News and the local TV stations are good at representing the current news of the day. However, they don't always have the resources or interest in covering the stories of our community. This project would attempt to highlight a story that few have heard before and at the same time contribute to the discipline of documentary storytelling. No other organization is creating long form video packages focused on our local Goshen community.

**Background expected:**

The Maple Scholar student would need to meet the following requirements: (1) Have taken DMP I & II or the transferred credit equivalence. (2) Be at least a second-year student. (3) Have interest in journalism and storytelling (4) Ability to work well with others in group settings and also be a self-motivator.

**Anticipated Results:**SCHOLARLY BENEFIT

The discipline of journalism has seen tremendous changes and shifts in the last 10 years. Convergence is becoming more and more important in the field of communication. We would like to answer a few questions such as;

What unique untold stories are in our community?

Why have these stories not been told?

What about these stories will relate to an audience?

How do we tell a story that connects and is interesting?

What can we learn from our past and apply to our present?

INTERDISCIPLINARY BENEFITS

This project will give both the professor and the student interdisciplinary experiences within the field of Communication. Opportunities to use one area of study in another are always encouraged in our field because they all relate to each other so well.

The major interdisciplinary benefit is the research and qualitative study that goes into every story. As we saw in past years, for every story gathered there is an opportunity for the student to learn and research a topic in a discipline they never approached before. Their work educates the public on their story's topic.

STUDENT BENEFIT

In addition to the benefits already mentioned, the student would get to practically implement storytelling theories from classes. Our media student will also leave the project with portfolio material to use for jobs or internships. We will also submit the documentary to film festivals. These festivals serve as a form of peer reviewed publishing in our discipline.

GOSHEN COLLEGE BENEFIT

Goshen College will gain more community exposure and good PR. The community will also get one of its stories told to have for posterity. Past Goshen Spotlight projects have been shown to audiences in the thousands and been screened at festivals all over the country.

PROJECT EXPECTATIONS

The student is expected to work with the professor for 35-40hrs a week. Be self-motivated. Perform assigned tasks in a timely and professional manner. This includes all research, production, post production and audio. Ability to manage time and projects is a must.



### PROJECT FEASIBILITY

Each week will have goals and milestones to hit in order to complete the project in time. A full story outline will be finished prior to the start of Maple Scholars. Some filming and research will also be finished before June. This gives us time during the week to implement an evaluation process so we can improve on our workflow and style. Expectation would be 30hrs a week on the assigned video. Some of this time is going to be in the evenings and weekends.

### MAPLE SCHOLARS LEARNING OBJECTIVES FOR GOSHEN SPOTLIGHT:

- Apply practical storytelling techniques to the documentary form.
- Gain an understanding of a unique and interdisciplinary subject matter.
- Analyze research data of a subject to identify story elements
- Create a documentary in proper storytelling form to effectively communicate to a given audience

Eli Hochstedler, Maple Leaf in Action

**Maple Scholars Proposal for Summer 2024**

## **Goshen College's Eli Hochstedler & PAX Service**

**Joe Springer, Mennonite Historical Library, with Sarah Mast,  
Accounting**

### **Description:**

This project proposes to provide basic processing of an unusually rich trove of original source documentation of GC student leader and activist Eli Hochstedler (1942-1975). Hochstedler was among that part of the early 1960s Goshen College student body inspired by the civil rights movement to take their beliefs and causes and turn them into action. In 1965-67 after graduating from GC in 1965 with a biology degree, Hochstedler served two years in Bolivia with Mennonite Central Committee's PAX program. Returning to the U.S, he began graduate studies at Cornell University and was increasingly active in the draft resistance movement. He connected with the Young Quaker movement, and in the last years of his life worked as a counselor and teacher at Life Social Services Center in Philadelphia, where they were part of a Young Friends intentional community. He drowned in a canoe accident in 1975.

Hochstedler was a prolific diarist and photographer. His surviving family have graciously granted Goshen College access to all of Eli's papers, photos, recordings and articles of this time period. We propose to give special attention to sources documenting Hochstedler's interest and activities while participating in PAX.. The diaries provide daily entries of meetings and work completed. Documenting how Eli navigated the racial tension in the 1960s may give insight to others on the subsequent educational environment, student culture and racial interaction in the Goshen College community.

A student involved in this work will:

- Read a selected list of relevant secondary material about PAX in the United States
- Meet with mentors to determine strategies for completing various aspects of the project
- Produce a updated inventory of the Hochstedler collection
- Digitize rational subsets of some of the original materials and upload into an appropriate platform for storage and access (PALNI institutional repository or Mennonite Archival Information Database)
- Optionally, interview contemporaries of Hochstedler to provide additional context for the collection

- Complete a project to communicate some aspect of Hochstedler's time in PAX. Form of the project to be determined by interest and abilities of the student (e.g. essay, article, multimedia, short play, film, etc.)
- Participate in all regular gatherings of the Maple Scholars program
- Note: Tasks that work directly with original source materials will need to take place within standard working hours: M-F, 8-5.

**Background expected:**

- Interest in understanding the dynamics of early 1960s CO's, PAX and Mennonites as well as broader interest in peace and social justice activism
- Ability to read handwritten English
- Basic proficiency in keyboarding and ability to upload digitized materials into an existing digital platform
- Sufficient manual dexterity to handle source materials carefully during digitization ● Attention to detail and ability to stay focused.
- Previous experience in creating a written or multimedia project is a plus.
- Knowledge of Spanish is also a plus since there is a subset of source documents in Spanish

**Anticipated Results:**

- Inventory of all materials in Eli Hochstedler's collection to inform decisions of where/how best to preserve the collection for future use
- Digitized copies of rational subsets of original sources created/uploaded into existing digital platforms suitable for storage and access
- Student-produced project on Hochstedler's experiences in PAX

**Maple Scholars Proposal for Summer 2024**

**A natural experiment on groundwater withdrawals**

**Paul Meyer Reimer, Physics Department**

**Description**

NASA's GRACE missions have used satellite measurements of gravity to infer changes in "water storage" – both above and below Earth's surface. The first pair of satellites launched in 2002 and operated until October of 2017. The follow on mission, GRACE-FO, launched in May of 2018 and has extended the time series to the present. The coverage of the mission includes the onset and aftermath of covid.

In a previous Maple Scholar project we attempted to separate out or attribute the changes in water storage due to human uses and due to climate variations. We compared the GRACE measurements with the total water storage predicted by the Community Land Model (CLM) with retrospective climate inputs. The hope was that the CLM would account for the weather-dependent part of the change in water storage, and so subtracting this from the GRACE measurements would leave just the human-related water withdrawals. This worked well in certain areas of the U.S. and well-known areas in northern India which have experienced the largest sustained agricultural withdrawals globally. But it failed dramatically in parts of Alaska, where we found out a large discrepancy between the CLM and GRACE measurements that was unlikely to be due to human activities, but rather a result of CLM's too-simple-for-climate-change model of glaciers.

For this summer, I'm proposing that we again attempt a form of attribution study for water storage. For example, it seems plausible that during covid, industrial water use might have been curtailed, while agricultural activity, which can be pursued with less danger of contagion might have continued apace. We'll attempt a clustering study of regions grouped by greater and lesser changes in water storage during a window of covid economic impact and try to identify the common features of the ensuing clusters. We may need to work with additional demographic / economic data sets to identify differences.

A secondary goal of this project is to explore the data science training resources available through Purdue's "Data Mine" initiative, so the student will be expected to register for their computer cluster access and other resources. We will also have access to a shared Linux server – people.goshen.edu – at GC. Those are the only facilities and equipment needed to download, process and analyze publicly available data sources through the internet with open source software.

**Background expected**

A student working on this project should have an interest in exploring GIS (geographic information systems) data and analysis, and figuring out how to get meaningful information by synthesizing quantitative data from different sources. Any experience in programming, and a

willingness to develop your programming “toolbox” from wherever you’re starting will be helpful. A programming class is not explicitly required.

### **Anticipated Results**

I hope that in the course of this exploration we will come to a greater and more detailed understanding of the human factors related to water usage.

## **The use of minirhizotrons to estimate root turnover in a prairie experiment subject to experimental burning and grazing.**

**John Mischler, Biological Sciences**

1. **Description.** This Summer Research is part of a multi-year & multi-site project. There are potential possibilities for students to work in Kenya during the summer - these potential opportunities are contingent on funding outside of the Maple Scholar framework.
  - a. *Introduction & Background:* It is increasingly apparent that linking ecosystem science (e.g., nutrient stoichiometry, atmospheric N deposition, carbon cycling) with both biotic drivers (e.g., herbivory, above- and belowground net primary productivity – ANPP/BNPP) and abiotic drivers (e.g., fire, rainfall) in ecological communities is of critical importance if we are to advance both ecological theory and carbon sequestration goals. Grassland and savanna systems offer an ideal system in which to examine these linkages as they represent one of the historically largest reservoirs of carbon on earth (storing 50% more than forests and 15% of global reserves). Moreover, these systems are strongly regulated by the aboveground processes of herbivory (by megaherbivores) and fire making them an ideal system in which to test the linkages between aboveground drivers and belowground carbon cycling.

Despite the recent evidence suggesting that grasslands likely play a larger role than forests in sequestering stable carbon stores, management and restoration of savannas and grasslands for purposes of carbon sequestration has been less emphasized than forest systems (e.g., under-emphasized in the 2021 UN Climate Change Conference – COP26). On the contrary, restoration science applied to tallgrass prairies in the U.S. is primed to simultaneously test these theories while engaging communities in the process of restoration and carbon sequestration.

While it is clear fire and grazing are critical drivers in grassland and savanna systems, there are remarkably few fully replicated studies that simultaneously manipulate herbivory and fire to test responses of soil organic carbon (SOC) in grassland systems. These SOC studies contributed greatly to our understanding, but each lacked one or more elements of a fully crossed, fully replicated study design. Meta-analyses have highlighted this gap in the literature, emphasizing that fire is an important understudied component of grazed systems. We propose contributing to filling this gap in our understanding through a fully replicated long-term fire-grazing experiment here in Northern Indiana. This experiment has already been initiated using a 2X3 factorial design that fully crosses herbivory varied at two levels (intermediate grazing intensity, no-grazing) with burning varied at three levels (unburned, annual burn, triennial burn). The novel components of

our proposal include simultaneously quantifying attributes which test new paradigms in soil ecology (e.g., belowground root growth, microbial composition and necromass, pyrogenic carbon, and deep carbon) in the context of three fully replicated and crossed fire-grazing/browsing experiments. This existing experiment is ideally suited for this work as it has been in place long enough to demonstrate significant treatment effects (from our preliminary data). We will use these data to build a model (Structural Equation Modeling) that describes how: (1) SOC is influenced by new mechanistic paradigms in soil ecology and (2) further examine whether these mechanisms lead to interactions between fire and grazing.

- b. *Description of Summer Work:* Specifically, we are looking for a student to (i) install minirhizotrons in the prairie experiment this summer to observe root growth in response to treatment effects from fire and grazing, (ii) collect the soil from these minirhizotron installations, (iii) collect optical scans from the roots of these minirhizotrons, and (iv) help analyze these images.

Although the use of minirhizotrons has proven to be an important tool in studying belowground processes, we are not aware of any published studies that have used minirhizotrons to monitor belowground responses in a fully crossed fire and grazing study. Minirhizotron studies demonstrate that root turnover can contribute 60–80% of SOC in grazed grasslands, suggesting that root excavations designed to estimate belowground biomass as a “snapshot” of BNPP do not fully capture the contributions to rhizosphere processes. We propose using minirhizotrons to assess root linear growth, root turnover, and total root biomass (from which we can estimate relative BNPP).

Scanned images will be obtained using an AC-21 Minirhizotron Automatic Imager (Vienna Scientific) to measure below ground root length, area, volume, diameter, and branching angle. Scans will be repeated minimally in the dormant and growing season with this undergraduate assisting in training software to recognize roots. We will also convert pixel number of root material to root biomass estimates using regression models with total root biomass as a function of pixel numbers obtained from scans immediately after minirhizotron tube installation.

Plant tissue & bulk soil stoichiometry: We will collect and dry plant tissue samples during the growing season from aboveground and belowground growth, using clippings from pin frame calibrations and root samples from root biomass estimates during installation of minirhizotron cores and deep soil sampling. All plant tissue will be dried and ground on a Wiley Mill. Plant tissues and bulk soils (surface and deep samples) will be analyzed for %C and %N by combustion via an Elemental Analyzer (Costech ESC 4010 Elemental Analyzer, Valencia, CA, USA). Plant-available P will be extracted via Mehlich-3 procedures and analyzed using a Biotek Powerwave HT Absorbance Microplate Reader.

2. **Background expected.** This work is ideal for any student who has completed the first year Eco/Evo sequence through Goshen College Biology.

3. **Anticipated Results.** Anticipated results include both (a) a continued building of the long term datasets for the prairie research project as well as (b) the training of an undergraduate student who hopefully will be able to continue this research work during subsequent years at Goshen College. These outcomes will both serve to enliven the research atmosphere at Goshen College as well as connect students to wider communities of researchers.



Mentoring Teaching Faculty

**Maple Scholars Proposal for Summer 2024**

**Outcomes and Evaluation of a Mentoring Program for New Teaching Faculty at Goshen College**

**Jody Saylor, Faculty Development & Academic Innovation**

**Description:**

Goshen College developed a one-year mentoring program for newly hired teaching faculty six years ago. However, four years ago, the college received a grant from the Lilly Fellowship Mentoring program to more fully develop and expand the program. As a small, faith-based institution, GC has created a fairly unique mentoring program and we hope to expand this model to other groups of new hires. This research project would ask a student to organize and analyze the data collected over six years of the mentoring program to measure aspects that are most effective at improving faculty retention, sense of belonging, campus engagement, and/or teaching success, or another area of interest to the student. It would also be desirable to compare the outcomes of the two different program models that have been implemented. Additionally, the research will inform the creation of a new evaluation tool using a Logic Model. This research will help shape the onboarding, orientation, and mentoring that is provided for new employees at GC.

The Maple Scholar will be expected to complete a small literature review on best practices in mentoring, plus reading about the Logic Model of evaluation. In addition to analysis of existing data, the student will also be expected to conduct follow-up interviews with program participants. Additionally, the student will be expected to design a new evaluation tool for the mentoring program using the Logic Model, which is used in many fields including business and education.

**Background expected:**

No particular expertise is required for this research, though students with an interest in developing their interviewing, writing, program evaluation, and/or data analysis skills are encouraged to apply. Applicants should have some experience with data analysis and basic statistics, or be willing to learn. A second- or third-year student in sociology, social work, education, business, math, and the sciences would find this project relevant to their professional development.

**Anticipated Results:**

The results of this study will help shape the new faculty mentoring program going forward and the new evaluation tool will be implemented. Students will present this work at the Academic Symposium, but further development of this project is planned to lead to publication and conference presentations. The Maple Scholar is welcome to participate in these further activities if interested.

Apache Stronghold

**Maple Scholars Proposal for Summer 2024**

**Protection of the Land:**

**The Cosmologies and Land Relations of the Apache-Stronghold**

**Kendra Yoder, MSW, PhD Department of Religion, Justice, & Society**

**Description:**

This Maple Scholars project will focus on research questions about Apache cosmologies and land relations through the current advocacy efforts and life experiences of [Apache-Stronghold](#) members. The Apache-Stronghold is a nonprofit, community based organization with the purpose to challenge the on-going colonization of Apache Holy sites, defend indigenous freedom of religion, and build community through civic engagement. The Apache-Stronghold is led by Dr. Wendsler Nosie Sr., former Chairman and Councilman of the San Carlos Apache Tribe. He is a Chiricahua Apache on his paternal side and Yavapai Apache on his maternal side. His ancestors were relocated to the San Carlos Reservation as prisoners of war, where he was later born. He currently resides at Oak Flat, an Apache sacred site. One of his current advocacy projects focuses on defending Oak Flat from Resolution Copper, a foreign mining company, that continues to push for expanded mining rights on this Apache Holy site. This exploratory research will center Apache voices and scholarship to help document the efforts of the Apache-Stronghold organization, as well as help illuminate for non-indigenous people the Apache cosmologies that guide their efforts to protect the land and their Holy sites.

This project will include an expanded literature review focused on Indigenous cosmologies and land relationships. This will include an historical account of the San Carlos Apache with particular attention to Oak Flat and Mount Graham, two of the Holy sites the Apache-Stronghold is currently committed to protecting. The student researcher will also have an opportunity to visit Arizona as an invited guest of the Apache-Stronghold, where they will meet with Dr. Noise Sr and other members of the Apache-Stronghold organization. During this time, the student will collect data by utilizing qualitative methods including in depth interviews, content analysis of organizational documents and video footage, and participant observation of public meetings and events. The student will integrate the literature review and qualitative data into a final paper and poster session.

This Maple Scholars research proposal is being proposed in collaboration with Sarah Augustine, who is a Pueblo (Tewa) descendant, as well as the cofounder and executive director of the [Coalition to Dismantle the Doctrine of Discovery](#). She is also the co-founder of Suriname Indigenous Health Fund (SIHF) and an Affiliate Faculty at Goshen College, teaching Indigenous Rights, GLST 300, on a biannual basis. Through her teaching, writing, and advocacy work, along with her mentorship of [One Circle](#) student leaders, she has created a unique opportunity and connection for a Goshen College student to work on research to support the Apache-Stronghold and the Coalition's commitments of Indigenous social and environmental justice in collaboration with Kendra Yoder, GC Sociology faculty. Both the Apache-Stronghold and the Coalition to Dismantle the Doctrine of Discovery support this proposal.

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**Background expected:**

This project requires an upper level student researcher familiar with the Apache Stronghold and the Coalition to Dismantle the Doctrine of Discovery. A social science background in qualitative research methods, as well as experience living and learning in southwest Indigenous communities, is strongly preferred.

**Anticipated Results:**

The anticipated results for this qualitative research project is a well researched and written paper integrating interview, participant observation, and relevant scholarship in support of our research questions. I also anticipate that this preliminary paper will serve as a possible foundation for a senior research thesis with professional conference presentations and publication potential. Another result is to continue to strengthen Goshen College's collaboration with the Coalition as we prepare the next generation of leaders for advocacy and scholarship in support of Indigenous people everywhere.