LEWIS & CLARK COLLEGE
DINAH DODDS ENDOWMENT GRANT PROPOSAL

Sasha Bishop	New Zealand 2015 Biology Focus
Name	**Overseas Program/Department**
March 12, 2015	$2,000
Date of Request	**Amount Requested**

Title of Project: Genetic Diversity of Amphinectidae in Private Land Reserves

Brief description of the project and its relation to overseas programs and/or international education at the college.
This project aims to census the presence and genetic diversity of arachnids in private reserves on mainland New Zealand. Particularly, it will focus on the family Amphinectidae, a widespread yet largely unstudied group of litter-dwelling spiders. Spiders often function as bio-indicators for ecosystem health, a topic of intense focus in New Zealand. Throughout our program, NZ's public and governmental investment in conservation has been emphasized as a leading contemporary issue. This study allows me to further explore private conservation methods in NZ while also helping to inform these efforts and gain a greater understanding of this unique country's biota.

BUDGET

Minor Items of Equipment:
$500 - PCR and DNA Extraction Reagents:
*This is a very rough estimate as I am still in conversation with Victoria University and Lincoln University regarding what reagents may be available to me through their facilities.

Travel:
$300 – Round trip between Wellington and Christchurch
$100 – Daily transport to lab and collecting sites

Miscellaneous:
$1000 – Sequencing costs through Lincoln University are $10/well and a single plate has 100 wells
Hostels in Christchurch

Applicant Signature: Sasha Bishop Digitally signed by Sasha Bishop DN: cn=Sasha Bishop, o, ou, email=sashab@lclark.edu, c=US Date: 2015.03.13 03:49:30 -07'00'

Approved by: com.apple.idms.appleid.prd.744b50466a747 93862716e64766c51566e4b36446f413d3d Digitally signed by com.apple.idms.appleid.prd.744b50466a747 93862716e64766c51566e4b36446f413d3d DN: cn=com.apple.idms.appleid.prd.744b50466a747 93862716e64766c51566e4b36446f413d3d Date: 2015.03.13 22:54:33 +12'00' Date: 13 Mar, 2015

(Students applying for funding must have the signature of the program faculty leader or departmental faculty contact.)

Proposals should be sent to overseas@lclark.edu (electronic version), and to MSC 11 or the Office of Overseas and Off-campus Programs (hard copy).

Importance:

I have always had held a lifelong interest in conservation, and even as a young child stated that my dream job was to "travel around the world saving endangered species." While my goal in life is no longer to be some sort of animal super-hero, the goals of conservation and preserving biodiversity are still important to me and feature strongly in my academic and career goals. During my time at Lewis & Clark, these goals have become more focused, and my interests now lie largely in studying conservation through an evolutionary perspective. The biology-focus trip to New Zealand has tremendously enhanced this area of my studies by focusing on the evolutionary and genetic concepts surrounding biogeography, the process of adaptation to extreme environments, and how all these concepts are being applied to conservation here in New Zealand.

This project gives me the opportunity to further explore these concepts while also contributing to my own research skill set and to New Zealand conservation efforts. One of the most important and highly focused-on issues in contemporary New Zealand is that of conservation. My time here has allowed me to acquaint myself with the unusually high level of public interest in conserving New Zealand's beauty and biodiversity and to become familiar with a few of the organizations deeply involved in driving conservation goals forward. One such organization is the QEII National Trust. QEII works on non-government owned land allowing private trusts and landowners to place legally recognized protections on their lands that are held in perpetuity. One drawback to being a non-government affiliated organization is a lack of government funding. As such, much of the land protected by QEII has had relatively little biodiversity work done on it. Providing a census of the arachnid diversity and genetic depth in a particular arachnid lineage will allow me to work directly with QEII representatives and landowners to develop a better understanding of the diverse range of ecosystems present across New Zealand and develop a model of national distribution patterns.

This project is also interesting to me in the role it plays in furthering understanding of divergence patterns and the generation of biodiversity. Islands have been recognized as playing an integral role in revealing evolutionary processes since the work of scientists such as Charles Darwin and Alfred Russel Wallace. Current island biogeographic theories continue contributing to the understanding of mechanisms involved in the generation of biodiversity such as species formation, adaptive radiation, and extinction (Ricklefs et al 2007). New Zealand is a continental island unique in its biogeography due to its relative isolation from continental landmasses and high level of endemic species. A study of arachnid biogeography on a New Zealand lineage (I will be focusing on Amphinectidae) will yield patterns of divergence unique to a relatively isolated geographic location and help determine how much, if any, species exchange may be occurring. Ecologically, this study will also address the overall idea of ecosystem health. Spiders are predatory and function at the top of the invertebrate food chain in a forest. As such, they are considered keystone species by some and the presence of wide spider diversity is thought to indicate good ecosystem health.

As far as my personal goals are concerned, this project allows me to work in close contact with scientists and conservationists and further my own skillset. I will be working in the lab of Cor Vink, an arachnologist at the Canterbury Museum, and will learn directly from him the process involved in classifying and describing a new species. Through my work with him and with QEII, I will be able to interact directly with how varying perspectives are collaborating to address biodiversity and conservation studies in New Zealand.

Procedure/Duration:

Throughout the course of the New Zealand program the entire group participated in four arachnid collections across the North Island, and over spring break one other student and I collected at four more locations near Christchurch and Dunedin in the South Island. As the trip continues, a small group of student volunteers plans to cover two more locations in the South Island, including a possible collection on Stewart Island.

Collection is only the first part of a biodiversity study, and to complete the processing and assessment of these collections, I plan to stay in New Zealand for four extra weeks. The first part of analysis involves a broad census of the diversity collected. This requires hand sifting through all the leaf litter and identifying arachnids found through both aerial and ground searching. I have used my time over the past couple weeks at Victoria University to perform most of this broad-scale identification, separating out lineages to focus on genetically. As part of the continued research I will be spending more time with these specimens to get closer morphological identifications that will then be sent back to the landowners as well as to QEII as part of their efforts to understand and conserve New Zealand biodiversity.

The part of my research focused on the Amphinectidae family will involve isolating DNA from several genera and species across the family with a special focus on *Aorangia isolata*. I will be using mitochondrial gene fragments such as CO1 and 16s to develop a phylogenetic tree of the relationships between spiders within the amphinectid family. The aim of this is to determine more definitively whether *Aorangia isolata* truly belongs within Amphinectidae as it is a morphologically cryptic family and no genetic work has yet been performed to support *isolata's* family placement. Secondarily, I will also be doing a morphological description of the male specimen of *isolata* which thus far is only known in the literature by female specimens (I collected the mature male specimens necessary for this over spring break).

Other Funding:

I am a Neely Scholar at Lewis & Clark, and with that scholarship comes a $2,000 research stipend that I am applying toward biogeographic work in New Zealand. Approximately $1,000 of that funding was used over spring break for collection purposes, and I intend to use the remaining funds to continue my research at the end of the program. While this may cover some of my basic expenses such as lodging, it is not enough to cover all research aspects, and the project will not be possible without further support from the Dinah Dodds Endowment.

Communication of Results:

The results of this research are of great interest to many parties here in New Zealand including the Canterbury Museum, Lincoln University, and a national conservation organization QEII. I have agreements with QEII representatives and landowners to share information regarding New Zealand biodiversity in exchange for access to private reserve land for collecting purposes and this will occur in the form of a brief report written about the various taxa found while on their land and a brief genetic analysis of the family Amphinectidae. Similarly, I utilized facilities at the University of Otago over spring break and, in thanks, will be sending a brief report to Daphne Lee in the geology department. In the continuance of this research, Cor Vink has offered use of facilities at both the Canterbury Museum (for morphological analysis) and Lincoln University (for molecular work). Ideally, the culmination of this research will result in a scientific publication of the description and classification of *Angorangia isolata,* a species that is not, as of yet, fully described. In the form of a publication, this

information will then be available to the museum and the scientific community as a whole.

Apart from interested parties in New Zealand, my goal is also to inspire greater interest in biogeography studies for future Lewis & Clark students in New Zealand. New Zealand is a biology program, and one of the courses focuses entirely on the theories of biogeography. I hope that this project will form the basis for future Lewis & Clark students to continue exploring the diversity of New Zealand. As such, I will be blogging on the overseas program webpage to advertise the possibility of this research, and would love to create a poster summarizing the process and findings that can be made available to other interested students.

Collaborators:

My primary on-campus contact and advisor for this project is Professor Greta Binford, who is currently leading the New Zealand program and in whose lab I have been working for the past year. With Greta's support, I have established connections with Cor Vink (Adjunct Professor at Lincoln University and Natural Sciences Curator at the Canterbury Museum) and Daphne Lee (Associate Professor of Geology at University of Otago) here in New Zealand. I worked directly with both of them in the field and in the lab over spring break, and will be returning to the facilities at the Canterbury Museum to complete this research. Some of the specimens used for genetic analysis come from my own collections while others will be taken from Cor Vink's specimen store and will contribute to the information on the museum's natural history collection. Throughout this process I have also been in close contact with a conservation group called QEII. QEII is a conservation organization that allows private landowners to place legally recognized conservation covenants on their lands and I have been working in close collaboration with both QEII representatives and individual landowners to gain access to their lands for collecting. As part of this agreement, I will be sharing my results with these landowners and providing them with information regarding the genetic biodiversity on their lands.