Leaflet anatomical variation among plicate-leaflet species of Zamia (Cycadales, Zamiaceae)

The ASPT research grant allowed me to travel to the Instituto de Ecología (IE), in Xalapa, Mexico (Oct. 28-Nov. 10) and work with expert cycad anatomist Dr. Andrew Vovides on comparing internal leaflet anatomy of Zamia species with broad, strongly veined leaflets. These species have leaflets with similar macromorphology but are highly polyphyletic according to my ongoing phylogenetic research. The purpose of the trip was to investigate whether these species exhibited similar or differing internal leaflet anatomy, and preliminary data obtained suggests that there are anatomical differences between some of the species, such as the presence or absence of girder sclerenchyma, that may be useful diagnostic characters within the genus. A total of 45 slides were prepared and permanently mounted, including sections from 20 individual species of Zamia. Preparations included transverse cross sections (sliding and rotary microtome) from the center and margins of the midpoint of individual leaflets, as well as epidermal peels. The best sections were double stained with safranin and fast green and permanently mounted on slides. Slides are currently being examined microscopically, and microphotographs taken to produce a reference collection. Data collection and analyses utilizing these prepared slides is currently ongoing.

Amount awarded: $1000 - Shirley and Alan Graham Graduate Student Research Award
Phylogenetic assessment of hybridization across the subtribe Iochrominae (Solanaceae) using target enrichment and newly developed sequencing techniques

In our funded proposal we aimed at Illumina sequencing pcr amplicons from over 50 nuclear loci to resolve the phylogeny of the genus *Iochroma* in the face of ongoing hybridization. We have since changed our design to use a targeted sequence capture approach which utilizes predetermined baits for hybridization to prepared Illumina sequence libraries. This approach allowed us to use preexisting bioinformatic resources to quickly design baits for over 200 single copy genes without having to do time intensive PCR design, optimization, and cloning. We currently are preparing the Illumina sequence libraries, on October 7th I will travel to a lab at the Ohio State University to perform the sequence capture reactions and we will use emulsion pcr to amplify the capture libraries and multiplex and submit them for Illumina sequencing by November 2013. The funding from ASPT allowed our lab to use a more high powered approach than we originally intended, which is expected to yield much more power for discriminating evolutionary relationships between our study organisms.

Amount awarded: $1000 – W. Hardy Eshbaugh Graduate Student Research Award
I am working on the taxonomy of *Vaccinium* sect. *Cyanococcus* to resolve complicated morphological, ecological, and genetic differences. I am also examining the ecological differences between the cytotypes (diploid and tetraploid) within this genus and the relative performance of these varieties for ecological restoration. The research is ongoing, and the funds provided by ASPT were used to conduct fieldwork for a phenological study of cytotypes completed in the spring of 2013. Results are currently being analyzed. The research funds are also being used to purchase materials for a heterozygosity study of the cytotypes. This genetic work will be useful in restoration practices by providing information on the plants that are best suited to their habitats.

Amount awarded: $1000
I used the funds provided by the ASPT grant to cover travel expenses for field work in Jamaica. This country is the center of diversity of _Hohenbergia_ subgenus _Wittmackiopsis_ (Bromeliaceae), a monophyletic group nested within the _Ronnbergia_ clade. I collected specimens, tissue, and habitat information of the species in order to reconstruct the evolutionary history of the group and understand the importance of Jamaica for the diversification of the group. I am currently processing the tissue samples for DNA extraction and anatomical studies at the laboratories of Molecular Systematics and Structural Botany of the New York Botanical Garden to complete the results of my ongoing doctoral research. I am also using the collected herbarium specimens to produce a taxonomic monograph of _Hohenbergia_ subgenus _Wittmackiopsis_.

Amount awarded: $850
Integrating phylogeny, morphology, and population genetics: investigating species relationships in *Paysonia* (Brassicaceae)

The funds awarded to me by ASPT were used to cover the sequencing costs of one of the nuclear loci that I used to reconstruct a molecular phylogeny of the genus *Paysonia* (Brassicaceae). A portion of the funds was also used for some of the lab costs associated with conducting a microsatellite analysis of the Tennessee *Paysonia*. This grant was instrumental in finishing the lab work needed for my Master’s research project, which was successfully defended July 2013. I am currently preparing a manuscript of my findings for publication.

Amount awarded: $850
Evolution and Phylogeography of Rare, Endemic *Campanula* Species (Campanulaceae) in the Eastern Mediterranean

Funds from the ASPT Research Grant are being used for a phylogeographic study of a small clade of Mediterranean Bellflowers (*Roucela* complex). I have now completed all necessary field-work throughout the Mediterranean including Greece, Italy, France, Spain, Portugal, and the Azores islands. Lab work is currently in progress and DNA isolation of all individuals has now been completed. The phylogeny of the *Roucela* clade within the larger Campanuloideae has been completed and results from biogeographic and phylogenetic analyses are being written up for publication. This project is ongoing and the phylogeographic study will represent the final chapter of my dissertation, so the results will be published shortly.

Amount awarded: $850
Origin and Diversification of Monnina (Polygalaceae)

Thanks to the support of the ASPT, I was able to defray some of the costs related to the collection of specimens in silica gel, extraction kits and sequencing of 16 Peruvian collections (8 from material collected in the field, and 8 from herbarium specimens deposited at the USM herbarium).

While a previous phylogenetic study based on morphological data divided the genus into genera Monnina, Pteromonnina and Ancylotropis (Eriksen 1993), the phylogenetic analyses in this study, based on the nuclear markers ITS1 and ITS2, the chloroplast intron trnL and the intergeneric spacer trnLf, reveal the monophyly of Monnina and Ancylotropis. Species currently placed under genus Pteromonnina need to be transferred back to genus Monnina.

Upon the conclusion of ongoing phylogenetic and morphological analyses, it will be possible to present hypotheses regarding the biogeography and morphological evolution in the genus.

Amount awarded: $850
Morgan Gostel  
George Mason University  
Fairfax, VA  
USA

Understanding morphological innovation in two recent radiations of Malagasy  
Commiphora Jacq. (Burseraceae)

Funding from the 2012 ASPT Graduate Student Research Grant helped fund visits to two herbaria, which house the world’s best collections of Madagascan Commiphora Jacq. (Burseraceae). The use of funding from this award exceeded expectations and the use that was initially proposed, because I was able to greatly minimize costs. Between 21 February — 6 March, 2013 I traveled to St. Louis, MO to visit the herbarium at the Missouri Botanical Garden and collect extensive morphological data from a suite of 78 characters from specimens housed there. I was able to minimize expenses for this trip to under $400.00 (including airfare and lodging), which left me with enough funding to support 10 days of lodging in Paris to visit collections at the herbarium of the Museé National d’Histoire Naturelle in Paris (8—18 June, 2013). During each visit, I collected morphological data from over 1,000 specimens, which will aid in the completion of an ongoing taxonomic revision, lead to the development of an interactive key, and also be used for morphological character assessment alongside ongoing molecular phylogenetics. All data collected as a result of financial assistance from this award contributes to ongoing dissertation research and will be published within the next year.

Amount awarded: $850
How many species of buckeye tree in China?

My ASPT award facilitated my travel within China to visit several large herbaria that house Aesculus L. (buckeye) species. In particular, I visited collections at The Chinese National Herbarium (PE), Sichuan University (SZ), Kunming Institute of Botany (KUN), and South China Botanical Garden (IBSC). I was able to examine and photograph hundreds of herbarium specimens to support my work delimiting Chinese species of *Aesculus* using morphometrics in conjunction with molecular phylogenetic data. Currently, I am taking measurements from my photographs of 11 morphological variables, which will be assessed with statistical analyses and ultimately aid in species delimitation.

Amount awarded: $800
Laura Lagomarsino  
Harvard University  
Cambridge, MA  
USA  

Phylogeny and the Evolution of Vertebrate Pollination Syndromes in the Neotropical Lobelioideae

Funds provided by the ASPT Graduate Student Research Grant were used to visit the Missouri Botanical Garden in October 2012, home to one of the largest collections available of Neotropical Lobelioideae, the 600 species of plants whose phylogeny and evolution are the focus of my dissertation. I was able to obtain morphological measurements, locality data, and other useful information directly from their specimens, in addition to hundreds of digital photographs (and a large loan to my home herbarium) that will be important in my future work studying the evolution of morphology of these plants along a molecular phylogeny that I have generated, as well as in the creation of an online monograph. Also during this visit, I found a couple previously undescribed species hiding out in the herbarium cabinets that I will publish in the upcoming year and used locality information to plan what turned out to be a very efficient collecting trip to Perú in November and December 2012. I am very grateful to the ASPT for providing me the opportunity to visit one of the most important herbaria in the U.S.

Amount awarded: $800

Collecting the same Centropogon species first seen in the Missouri Botanical Garden (see inset) in Cusco, Perú a month later.
Diversification following a transition to mutualism

The fungal family Trypetheliaceae represents a putative evolutionary transition to the lichen-forming state. Thus, this lineage provides an opportunity to examine what morphological and ecological changes follow the transition to the lichenized state. The award has facilitated lab work (DNA extractions and sequencing reagents), and permitted the sequencing of additional Trypetheliaceae taxa, as well as putative members of this lineage. Samples sequenced were primarily from the Neotropics, with some also coming from Fiji, Thailand and New Zealand. These data have clarified the phylogenetic position of several taxa within this family, and ruled out the inclusion of others. Additionally, these data have helped illustrate the polyphyly of most genera in the family, while also illuminating a pathway toward the re-circumscription of genera. Resulting data from these funds have directly contributed to three manuscripts (one in press, one in review, and another to be submitted shortly), and is anticipated to result in at least one additional manuscript, the research of which is ongoing.

Amount awarded: $850

Thallus and fruiting bodies of two members of the crustose, lichen-forming family Trypetheliaceae: *Marcelaria purpurina* (left) and *Astrothelium galbineum* (right).
Suman Neupane  
Old Dominion University  
Norfolk, VA  
USA

Hedyotis L. (Rubiaceae) in Asia: phylogeny, character evolution, and biogeography

I am currently in Naturalis Biodiversity Center, in Leiden, The Netherlands, investigating secondary wood evolution in Hedyotis-Oldenlandia complex (Rubiaceae) with Frederic Lens and Erik Smets team. Hedyotis-Oldenlandia complex is a group of closely related genera that lies within a herbaceous tribe Spermacoceae in the Rubiaceae family. We are currently investing stem anatomical pattern of the secondarily derived woody species and use this information to address the broader issue of insular woodiness evolution in island or island-like system within Hedyotis-Oldenlandia complex. The support by ASPT Graduate Student Research Grant has played a crucial role in offsetting the costs of accommodation in Netherlands and allowed me to interact with the research team in Naturalis and explore the avenues of research related to wood evolution. Thank you so much ASPT for the funding.

Amount awarded: $850
I used my ASPT award to conduct fieldwork during Summer 2013 on the island of Moorea, French Polynesia. I sampled fern communities in eight plots along an elevational gradient, including both sporophytes and gametophytes. I collected over 600 fern gametophyte specimens, which I will identify using DNA barcoding and include in analyses of community composition and phylogenetic diversity. This is ongoing research and will be included as a chapter of my PhD dissertation.

Amount awarded: $850
The Diversification of the Evergreen Species of *Prunus* in the New World: Linking Form, Function and Environment through Evolutionary Time

Partially funded by the ASPT-GERG funds, from March 4 to 24, 2013, I visited the main Texas (TEX and BRIT) and Mexican herbaria (MEXU and XAL), in order to gather taxonomic and geographic information and simultaneously update the determination of Neotropical specimens of *Prunus*. In addition, I had a short field trip and collected specimens belonging to 4 species in the mountains surrounding the Mexican city of Xalapa, a previously identified high diversity spot for the genus. The revision of around 1200 mostly Mexican and Mesoamerican specimens, helped me to clarify the species-level boundaries within the genus and complete the treatment of the group for Flora Mesoamericana (already submitted). 31 species, including 12 novelties, are now recognized in Mesoamerica and 20 additional taxa in Central and Northern Mexico. Publications of the new taxa are currently in preparation and the geographic data collected have been geo-referenced and integrated into the Neotropical database of the genus (now including more than 6000 specimens) which furthermore, will be the main input for both the niche analysis and the taxonomic synopsis proposed as part of my PhD dissertation project.

Amount awarded: $850
The funds of the ASPT 2012 Grant for Graduate Students partially covered expenses incurred in completing this biogeographical project. The resources were used to include in our phylogeny additional samples of key species, and partially covered visit some European and Brazilian herbaria in order to review collections of the *Leandra* sensu stricto clade. We have built a robust database of georeferenced specimens (ca. 20,000 specimens), primarily based on data available online. However, the inspection of the original specimens in the herbaria was decisive for the extensive data curation process, as well the inclusion of new records not available online. During this time, I was able to check over 8,000 sheets of *Leandra* clade. Along with our phylogeny, this data has been used to try to understand the history of this diverse and nearly endemic clade. Preliminary results were presented at Botany 2012 (Columbus, Ohio) and the final results will constitute a chapter of my thesis (expected completion in 2014).

Amount awarded: $800
Systematic study of the *Tillandsia fasciculata* Sw. complex (Bromeliaceae)

The ASPT Graduate Student Research Grant supported travel for my dissertation research on the epiphytic *Tillandsia fasciculata* Sw. (Bromeliaceae) complex. The *T. fasciculata* consists of eight varieties of that species, 25 additional species, and three natural hybrids. Field work in Guerrero, Jalisco, Michoacán, and Oaxaca was crucial for completion of my study because several of the species of the *T. fasciculata* complex are only known from western Mexico. Leaf material from approximately 200 plants were collected. Five new taxa exclusively found in western Mexico were added to my analyses. Currently, DNA sequences from plastid and nuclear data sets are being analyzed to 1) evaluate the circumscription and phylogenetic position of the *T. fasciculata* complex; 2) determine relationships among its taxa; and 3) consider the role of geography in the evolution of *T. fasciculata* complex. Funding also allowed me to visit several herbaria including Centro de Investigación Científica de Yucatán, A.C. (CICY), Instituto de Ecología, A.C. (IEB), Universidad de Guadalajara (IBUG), and Universidad Autónoma de Guadalajara (GUADA). Over 1000 herbarium specimens were photographed and will be examined and geo-referenced for my work on predicting the occurrence of *T. fasciculata* in geographic space.

Amount awarded: $850
Further refining the circumscription of *Polypodium vulgare* L.

My ASPT award provided crucial funding for the generation of cloned nuclear sequence data as part of a phylogenetic survey of the *Polypodium vulgare* fern complex. I was able to greatly expand my sample size of *P. vulgare* and its progenitor species from eight to 23 accessions, producing a total of 180 additional clone sequences! Most importantly I was able to include individuals from undersampled, disjunct populations. This data will be included in a paper circumscribing multiple origins of allopolyploid species in the *P. vulgare* complex that is currently in preparation for submission to Systematic Botany.

Amount awarded: $1000