

60th ANNUAL MEETING OF
THE SOCIETY
FOR ECONOMIC BOTANY



The Future of Forests



University of Cincinnati

**Featured Session:
The Future of Forests:
Perspectives from Indigenous People,
Traditional Practices, and Conservation**

June 2 - 6 , 2019
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The Society for



ECONOMIC BOTANY, INC.
DEDICATED TO THE PAST, PRESENT AND FUTURE USES OF PLANTS BY PEOPLE

**60th Annual Meeting of
The Society for Economic Botany
Cincinnati, Ohio
June 2-6**

Annual Meeting Sponsors:
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Meeting Organizing Committee: David Lentz and Susan Allen, Co-Committee Heads. Hardy Eshbaugh, Cory Perfetta, Alexandra Golden, Mariana Vasquez, Hannah Clements, Martha Wendel, Michael Soellner

**PLENARY SESSION, Monday June 3
The Future of Forests: Perspectives from
Indigenous Peoples, Traditional Practices, and Conservation**

SEB Business Office, 4344 Shaw Blvd St. Louis, MO 63110 | SEB@econbot.org

SEB is a 501 c(3) non-profit organization registered in the state of NY.

The Society for Economic Botany (SEB) was established in 1959 to foster and encourage scientific research, education, and related activities on the past, present, and future uses of plants, and the relationship between plants and people, and to make the results of such research available to the scientific community and the general public through meetings and publications.

Meeting Schedule

Sunday, June 2

- 9:00 – 4:00 Council Meeting, 713 Rieveschl Hall
- Field Trips, Meet in Circle at intersection of West University Avenue and Commons Way
- 1:00 – 4:00 Cincinnati Zoo and Botanical Gardens, Leader: Alexandra Golden
- 1:00 – 3:00 Krohn Conservatory, Leader: Hannah Clements
- 1:00 – 5:00 Fort Ancient, Leader: Kenneth Tankersley
- 1:00 – 4:00 Whitewater Shaker Village, Leader: David Lentz
- 5:00 – 8:00 Registration Table, Tangeman University Center, northwest entrance
- 6:30 – 8:30 “Phytotherapies: Plants that Heal” Exhibit Opening and SEB Welcome Reception, Meyers Gallery Steger Student Life Center

Monday, June 3

- 7:30 - 3:00 Registration, Lobby in front of 450 Lindner Center
- 8:30 – 9:00 Welcoming Speech, 450 Lindner Center

Plenary Session Part I, 450 Lindner Center

- 9:00 - 9:45 M. Kat Anderson, Mixed Conifer Forests Of The Sierra Nevada: Past, Present & Future
- 9:45 – 10:30 Michael Hopkins, Amazon Forest Management – Basic Botany And Sustainability
- 10:30 – 11:15 Robert Bye, Forest Management In The Sierra Tarahumara
- 11:15 – 12:00 James S. Miller, Achieving Sustainable Conservation In Madagascar
- 12:00 – 1:00 LUNCH on your own

Plenary Session Part II, 450 Lindner Center

- 1:00 – 1:45 Theresa Culley, Protecting The Future Of Our Forests: Limiting The Impact Of The Introduced Ornamental Callery Pear Tree
- 1:45 – 2:30 Kathleen D. Morrison, Forest Islands Revisited: Sacred Groves, Inselbergs, And Socionatural Histories In Southern India
- 2:30 – 3:15 Michael Dockry, Forest Futures: Building Partnerships With Tribes To Integrate Indigenous Knowledge Into Natural Resource Management
- 3:00 – 4:00 Coffee Break
- 3:45 – 4:45 Panel Discussion ***Ethics in Ethnobotany*** by: Mark Nesbitt (Chair), Georgia Fredeluces-Hart, Jillian De Gezelle, Cassandra Quave, John Rashford, 450 Lindner Center
- 5:00 – 6:00 Dinner on Your Own
- 6:00 – 6:45 Movie with Q/A : ***Trees in Trouble: Saving America’s Urban Forests*** produced by Andrea Torrice, discussant Dave Gamstetter, 450 Lindner Center
- 6:45 – 8:00 Movie with Q/A: ***A Force for Nature: Lucy Braun*** produced by Meg Hanrahan Media and Voyageur Media Group, Inc., discussant Meg Hanrahan, 450 Lindner Center
- 7:30 – 11:00 Student Networking Social, Meet outside Richard E. Lindner Center

Tuesday, June 4

8:00 - 3:00 Registration, Lobby in front of 450 Lindner Center

Concurrent Paper Sessions 1 and 2

Applied Ethnobiology and Conservation, 450 Lindner Center

- 8:00 – 8:15 Grady Zuiderveen, Range Wide Study Of Goldenseal (*Hydrastis canadensis* L.) Trade, Buying Practices, And Stakeholder Perceptions Around Conservation
- 8:15 – 8:30 Edelmira Linares (Chair), Traditional Food Preservation Techniques Employed In The Sierra Tarahumara, Mexico
- 8:30 – 8:45 Ryan Huish, Appalachian Forest Medicinal Plant Harvests: Measuring The Size And Distribution Of Regional Harvests And Establishing Methods Of Local Population Assessments And “Responsible Harvesting” For Forest Farmers
- 8:45 – 9:00 Jim Penn, Tropical Forests, Agroforestry Systems And Plant Resources: Conservation Challenges And Indigenous Perspectives From Amazonia And Nicaragua
- 9:00 – 9:15 Eric Burkhart, Neither Wild Nor Cultivated: American Ginseng (*Panax quinquefolius* L.) Trade Surveys In Pennsylvania, U.S.A., Provide Insights Into Husbandry Of An Internationally Traded Non-Timber Forest Product.
- 9:15 – 9:30 Robbie Hart, Hosting The Mountain: Naxi Courtyard Gardens As Repositories Of Himalayan Flora
- 9:30 – 9:45 Nina Fontana, Ethnoecosystems Of The Carpathian Mountains: Roots And Future Implications

Ethnobotany of Medicinal Plants, 850 Lindner Center

- 8:00 – 8:15 Anywar G., Medicinal Plants Used By Traditional Medicine Practitioners To Boost The Immune System In People Living With HIV/AIDS In Uganda
- 8:15 – 8:30 Hazrat Bilal, Ecological Footprint And Sustainability Aspects Of Commercial Medicinal Plants Harvest In District Swat, KPK Pakistan
- 8:30 – 8:45 Orou Gaoue, Phylogeny Reveals Patterns Of Non-Random Medicinal Plant Selection By Local People
- 8:45 – 9:00 Olubunmi Sharaibi, Inventory Of Medicinal Plants In Atan, Okansoso, Village, Badagry, Lagos State, Nigeria: Strategies For Biodiversity Conservation. &Am
- 9:00 – 9:15 David Picking (Chair), Medicinal Plant Knowledge In Portland And Kingston, Jamaica: An Historic Comparison.
- 9:15 – 9:30 Santhosh Kumar, Indigenous Knowledge Of Medicinal Plants Used By Ethnic Communities Of South India
- 9:30 – 9:45 Brian Doyle, Bioactivity Of Plants Used As Cosmetics In The Ecuadorian Amazon
- 9:45 – 10:00 Isabel Hulley, Traditional Uses Of *Elytropappus Rhinocerotis* (Asteraceae) Against Foot Odour And Other Skin Diseases

9:30 – 10:30 Coffee Break

Concurrent Paper Sessions 3 and 4

Socio-environmental Dynamics 1, 450 Lindner Center

- 10:30 – 10:45 Madeline Donald, A Shaded Understory: Interacting With Associated Species In Trinidadian Cocoa Agroforestry
- 10:45 – 11:00 Georgia Fredeluces-Hart, Modeling Future Biocultural Scenarios Of Beargrass Use In Pacific Northwest Forests
- 11:00 – 11:15 Alan P. Sullivan (Chair), Anthropogenic Forest Fires: Archaeological And Ethnographic Perspectives
- 11:15 – 11:30 Bhagawat Rimal, Forest And Indigenous Communities In Remote North-Western Border Districts Of Far West Nepal
- 11:30 – 11:45 Elspeth Mathau, Everything Is Touga: Adaptive Strategies To Changing Fodder Accessibility In Two Moroccan High Atlas Mountain Indigenous Communities

Food and Foodways 1, 850 Lindner Center

- 10:15 – 10:30 Dario Perez, Traditional Agronomic Practices In Disuse And Phytopathological Problems: The Case Of Xpm Dispersion In The Cassava Cultivation From The Colombian Caribbean

- 10:30 – 10:45 Robert Voeks, Carurú: The Enigmatic Origin Of Brazil's Signature Afro-Brazilian Dish
 10:45 – 11:00 Teal Jordan (Chair), Ramping Up The Harvest: Phytochemical Variation In *Allium tricoccum* Across The Growing Season In Pennsylvania
 11:00 – 11:15 Megan Mucioki, Karuk Agroecosystem Resilience And Cultural Foods And Fibers Revitalization Initiative: Xúus Nu'éethi – We Are Caring For It
 11:15 – 11:30 Sule Dogan, An Ethnobotanical Review Of *Laurus nobilis*: Apollon's Beloved Daphne
 11:30 – 11:45 Giulia Mattalia, The Emotion Of The Forest: Contrasting Perspectives From Carpathian Mountains (SW Ukraine) And Apennine Mountains (Central Italy)
- 11:45 – 12:30 LUNCH on your own
- 12:30 – 1:30 Panel Discussion: **Looking To Nature For Cancer Treatments**, Patricia Van Skaik (Chair), Douglas Kinghorn and Susan Mooberry, panelists, 450 Lindner Center
- 1:30 – 4:30 Workshop #3 Seeing Seeds, 606 Rieveschl Hall

Concurrent Paper Sessions 5 and 6

Socio-environmental Dynamics 2, 450 Lindner Center

- 1:30 – 1:45 Ripu Kunwar, Indigenous People And Forest Management Practices In The Kailash Sacred Landscape And It's Surrounding Areas Of Far West Nepal
 1:45 – 2:00 Junko Kitagawa, Pine Forest Development And Salt Production In Wakasa Town, Central Japan
 2:00 – 2:15 Maria Fadiman, Globalization And Tradition: Ethnobotanical Case Study In A Rural Village In Bhutan
 2:15 – 2:30 Daniel Murphy (Chair), Knowing Our Future Forests: Exploring The Institutional And Cultural Dynamics Of Uncertainty And Knowledge In Forest Planning
 2:30 – 2:45 Roy Vera-Velez, Chakras: An Indigenous Agricultural Practice Enabling Biodiversity Conservation
 2:45 – 3:00 Wendy Klooster, Ecological And Social Impacts Of Widespread Ash Tree Mortality

Food and Foodways 2, 850 Lindner Center

- 1:30 – 1:45 Kathutshelo Magwede, A Quantitative Survey Of Vhavenda Food Plants
 1:45 – 2:00 Wyatt Cole Westerkamp (Chair), Practice And Tenure Of Wild Edible Plants Of The Nilgiri Biosphere Reserve
 2:00 – 2:15 Yinxian Shi, Poisonous Delicacy: Ethnobotany Of Edible Rhododendron Flowers
 2:15 – 2:30 Lloyd Mhlongo, Food From The Forest: Zulu Edible Plants Of Amandawe, Kwazulu-Natal, South Africa
 2:30 – 2:45 Yao Fu, Herbal Teas Used As Both Food And Medicine: Case Study From China
 2:45 – 3:30 Coffee Break
 3:30 – 4:00 David Spooner's Brown Award Address, 450 Lindner Center
 5:00 - 6:30 Society for Economic Botany General Membership Meeting, 450 Lindner Center
 7:30 – 10:30 Micro-brewery tour, Bus Leaving at 7:30 from Circle at Intersection of West University Avenue and Commons Way. Bus picking up at 10:15 from Taft Ale House.
 7:00 – 9:00 Movie with Q/A: **Guardians of the Forest** produced by M. P. Gilmore and directed by J. Wager, 450 Lindner Center

Wednesday, June 5

- 8:00 – 12:00 Registration, Lobby In front of 450 Lindner Center

Paper Session 7

Mesoamerica, 450 Lindner Center

- 8:00 – 8:15 Andrew Mcdonald, Water Lily Symbolism In Central Mexico

- 8:15 – 8:30 Jill Korach, Personal Values And Knowledge Of Locally Important Plants And Places In Belize
 8:30 – 8:45 Renee Bonzani, Pine/Palm “Plantations” And “Heirloom” Trees: Carbonized Wood Remains From The Matacanela Site, Veracruz, Mexico
 8:45 – 9:00 David Lentz, Geochemical And Molecular Genetic Data From Reservoir Sediments Of The Ancient Maya City Of Tikal: Sustainability And Collapse
 9:00 – 9:15 Andrew Wyatt (Chair), The Use Of Palm (Arecaceae) In Maya Ritual
 9:15 – 9:30 Nanci Ross, Placing Human Landscape Legacies In A Dynamic Systems Framework
 9:30 – 9:45 Martin Stevens, Community-Level Fruiting Phenology May Be More Stable In Garden Forests Of The Ancient Maya

9:30 – 10:30 Coffee Break

10:00 - 11:30 Poster Session, 5/3rd Arena – West Concourse

Paper Session 8

New Frontiers in Ethnobotany , 450 Lindner Center

- 10:00 – 10:15 Elizabeth Green, Habitat Suitability Modeling Of Culturally Important Plants At Wind Cave National Park
 10:15 – 10:30 John De La Parra, The Future Of Ethnobotany: From Indigenous Intelligence To Artificial Intelligence
 10:30 – 10:45 Blair Orr, Using Ethnobotany To Teach Global Literacy
 10:45 – 11:00 Ernest Anemone, Teaching Ethnobotany By Learning From Cannabis: Toward A Better Model Of Understanding Medicine And Law
 11:00 – 11:15 Cassandra Quave (Chair), Ethnobotany-Guided Identification Of Antibiotic Resistance Modifying Agents For Multidrug-Resistant Infections
 11:15 – 11:30 Aurelie De Rus Jacquet, Nepalese And Native American Traditional Herbal Medicines Used To Treat Parkinson’s Disease: An Exploration Of Their Untapped Potential To Restore Neuronal Health
 11:30 – 11:45 Mandy Hansel, Go Green-Collar: A Longitudinal Study Of Employment Motivation Within Public Horticulture
 11:45 – 12:45 LUNCH on your own or Student Mentoring Lunch, Taft Center - Edwards I
 12:00 - 1:00 16th Biocultural Collections Workshop with Mark Nesbitt and Eric Tepe (Chair), University of Cincinnati Herbarium

12:30 – 2:00 Coffee Break

- 1:00 – 4:00 Workshop #2 Compiling Tools And Charting The Course: Co-Creating An Ethnobotanical Valuation Toolbox For The Anthropocene, 734D Rieveschl Hall
 1:00 – 4:00 Workshop #5 Geography Of Viticulture, Lecture, And Wine Tasting, Taft Center – Edwards 1
 1:00 – 4:00 Workshop #6 Including Pollinators In Traditional Forest Practices And Conservation, 638 Rieveschl Hall
 1:00 – 2:30 Workshop #7 Networking For Applied Ethnobiology-Ethnobotany Practitioners, Professionals, And Scholars, 713 Rieveschl Hall
 2:30 – 4:00 Workshop #1 Engaging The Public: Documenting Your Work In Under A Minute, 713 Rieveschl Hall

Paper Session 9

Ethnobotany, 450 Lindner Center

- 2:00 – 2:15 Sibonelo Mbanjwa, Ethnobotanical Survey Of Useful Plants In Ixopo Area, Kwazulu-Natal, South Africa
 2:15 – 2:30 Ben-Erik Van Wyk, New Insights From A Broad Review Of Southern African Ethnobotany
 2:30 – 2:45 Catherine Nnamani, Etymology Of Folk Nomenclatures For *Sphenostylis stenocarpa* (Hoechst Ex A. Rich) Harms

- 2:45 – 3:00 Mark Merlin (Chair), Three Decades Of Ethnobotanical Research And Educational Initiatives In Micronesia
- 3:00 – 3:15 Art Whistler, Half A Lifetime Of Polynesian Ethnobotany
- 4:30 – 6:00 Tour: National Underground Railroad Museum and Freedom Center, Bus leaving at 4:15 from Circle at Intersection of West University Avenue and Commons Way
- 6:00 – 9:00 BANQUET & Awards Ceremony, National Underground Railroad Museum and Freedom Center, Bus leaving at 5:45 from Circle at Intersection of West University Avenue and Commons Way

Thursday, June 6

Field Trips, Meet in Circle at intersection of West University Avenue and Commons Way

- 9:00 – 4:00 Edge of Appalachia, Leader: Sunshine Brosi
- 10:00 – 2:00 Big Bone Lick State Historic Site, Leader: Cory Perfetta
- 11:00 – 1:00 Cincinnati Civic Garden Center, Leader: Michael Soellner
- 11:00 – 2:00 Lloyd Library, Leader: David Lentz

ABSTRACTS

Abstracts are listed **alphabetically by first author** in the following categories:

1. Distinguished Economic Botanist
2. Plenary Panel
3. Organized Sessions
4. Workshops
5. Contributed Papers and Posters

DISTINGUISHED ECONOMIC BOTANIST

Trees And Intercropping In The History, Politics And Oral Traditions Of Jamaicans

John Rashford

Institution: College of Charleston

The attitude of Jamaican small farmers towards the cultivation of trees in contrast to herbs, vines and shrubs is directly related to property relations embodied in different forms of control over land. It is well-known that tenant cultivators generally do not plant or “save” trees for fear they will not be able to reap the benefits. This is a significant fact since a decision not to grow trees eliminates many useful plants from cultivation irrespective of their actual domestic and commercial value. This paper discusses the practical and inspirational importance of trees for Jamaicans and explores the social reasons why small farmers choose not to plant trees and to destroy the wild seedlings of trees that volunteers in their home gardens and fields. The presentation is based on the experience of growing up in Jamaica and on fieldwork that began in the 1980s and has continued to the present. As a contribution to this year's scientific symposium and a prelude to next year's annual meeting in Jamaica, the discussion traces the origin and development of my interest in Jamaican ethnobotany starting with my dissertation research on social class and intercropping in Jamaica. Over the years, this interest has expanded to include the concept of settlement vegetation and the nature of Jamaica's settlement vegetation; the origin of agriculture; the inspirational significance of the cotton tree, calabash tree, and fig trees which are featured in the oral, aesthetic, and spiritual traditions of Jamaicans; the colorful 'smiling' ackee as Jamaica's tree of life; the food crisis in the Caribbean and the introduction of the breadfruit; and the history and cultural significance of the baobab in Jamaica and elsewhere and in the story of hominin evolution.

PLENARY PANEL

Mixed Conifer Forests Of The Sierra Nevada: Past, Present & Future

M. Kat Anderson

Institution: Dept. of Plant Science, UC Davis

Based upon extensive field work with the Sierra Miwuk, Mono, and Foothill Yokuts Tribes, I describe past and present indigenous interactions in the mixed conifer forests of the Sierra Nevada. These ancient forests were a primary source of food and raw materials and over centuries, Native people developed techniques for managing the species on which they depended and the habitats in which these species occurred. These practices--which included judicious harvesting, seed beating, tillage, pruning, weeding, and most notably, burning--were based on empirically derived knowledge of species' reproductive biology, environmental needs, and interactions with other species. Employed to increase the vigor and usefulness of key plant species used for cultural objects such as baskets, these practices had significant broader ecological effects, including increased biological diversity, enhancement of the forests' ability to provide ecosystem services, creation of distinctly anthropogenic communities, and maintenance of a level of spatial and habitat heterogeneity higher than would have existed in the absence of human management. All of these broader ecological effects described above are consistent with the goals of the kind of forest management described in laws, policies, and regulations of our federal and state public lands agencies, yet indigenous management techniques and their concomitant ecological knowledge have NOT, by-in-large, been successfully brought to bear in developing new management strategies for the forests of California. I explore the possible reasons for this. I describe the unhealthy state of the mixed conifer forests today with 140 million dead conifers and great biological and ecological impoverishment. I end my talk with exploring where I think the sea change in forest management will have to come from in order to bring back the health of these forests.

Forest Management In The Sierra Tarahumara

Robert Bye

Institution: Universidad Nacional Autónoma de México (UNAM)

This paper will focus on the cultural perspectives and traditional practices of forest management and the social context of choices concerning sustainable resource use of the Rarámuri (Tarahumara), an indigenous group of Uto-Aztecan speakers who live in the northern sector of the Sierra Madres in the state of Chihuahua, Mexico. Today, the forested environment is quite variable as it ranges from the seasonally dry tropical forests in the barancas to the temperate pine-oak forests in the higher elevations. Of particular interest in this study is the interface between the cultivated landscapes and the temperate forests and the chiltepin "enrichment" in the short-tree forests. As this is one of the most biologically diverse ecosystems in North America, much of the discussion will address the attempts by the Rarámuri to maintain and recover non-timber forest products.

Protecting The Future Of Our Forests: Limiting The Impact Of The Introduced Ornamental Callery Pear Tree

Theresa Culley

Institution: University of Cincinnati

Within the past twenty years, temperate deciduous forests and pasturelands throughout North America have become invaded by the non-native Callery pear (*Pyrus calleryana*). This popular ornamental tree was originally introduced from China as rootstock for the edible pear (*P. communis*), but today, this species is cloned and commercially sold under various cultivar names, such as 'Bradford', 'Aristocrat', and 'Cleveland Select'. Fruit production in this self-incompatible species is now known to be triggered by cross-pollination between these genetically-different cultivars, followed by dispersal of the fruit by introduced European starlings and native robins. Seed production can even occur on a single commercial plant, if both the upper cloned scion and the lower grafted rootstock are allowed to flower. This situation now exemplifies an important conflict that sometimes occurs between our natural areas and commercialized plant species invading these sites – is the value of the natural ecosystem and the cost of protecting it from invasive species greater than the economic income generated by the commercial sale of these species? In this presentation, we will explore how land managers, researchers, and the

green industry can work together with the government to create feasible means of reducing the ecological and economic impacts of this invasive species within our native forests.

Forest Futures: Building Partnerships With Tribes To Integrate Indigenous Knowledge Into Natural Resource Management

Michael J Dockry

Institution: University of Minnesota

Indigenous knowledge, also referred to as traditional ecological knowledge, has sustained Indigenous people and their natural resources for thousands of years. Indigenous knowledge continues to shape tribal communities and their relationships with natural resources today. Indigenous people often tell us that our common future depends upon incorporating their wisdom and perspectives into social, economic, and ecological decisions. Scholars, natural resource managers, and Indigenous people generally agree that Indigenous knowledge is important for managing our ecosystems and addressing our integrated social, economic, and ecological challenges like climate change and invasive species. Despite the recognition of the importance of Indigenous knowledge, natural resource managers, scientists, and universities have struggled to integrate this knowledge into planning, management, policy, teaching, and research. My talk will discuss how tribal partnerships can serve as the foundation for integrating Indigenous knowledge with western natural resource management science. I will present results from my research on building partnerships with tribes and also provide practical partnership-building examples and strategies for working with tribes. The goal of building tribal partnerships is to increase the mutual understanding of diverse knowledges and more effectively incorporate tribal perspectives and Indigenous knowledge into natural resource management and research. This approach has the potential to fundamentally shift our relationships with each other and with the natural world and to chart a new path for a sustainable 21st century and beyond.

Amazon Forest Management – Basic Botany And Sustainability

Michael Hopkins

Institution: Instituto Nacional de Pesquisa da Amazonia (National Institute of Amazonian Research)

The forests of the Amazon Basin remain relatively intact, mostly because of their relative inaccessibility, and the historical failures of many of the regions' development projects. Sustainable management, especially of timber, is complicated by the scale of the tree diversity and longevity of large trees, probably making sustainable management with significant long-term financial return unviable. Evidence is mounting that before the European colonization of South America, Amazonia may have supported a population larger than it is today, and there is probably much to be learnt from that period about sustainable agricultural techniques and forest management, visible today in soil composition and distribution of some tree species. However, the composition of the forests, in terms of what species occur, has been very poorly explored, and the very low density of plant collections, and their extreme concentration in few places, has resulted in a deep shortfall of taxonomic knowledge, meaning that many (perhaps most) species of plants in the region have yet to be scientifically described, and that many described species may actually be complexes of closely related species. The shortage of names, knowledge of distributions, and the difficulties of identifying known species complicate, or even invalidate, the conclusions of many projects in the region. There is a dire need to increase the basic botany data produced by taxonomically-directed plant collection projects. However, funding for such projects is rarely seen as a priority, and ways must be found to integrate accelerated plant collecting with projects regional, especially involving inhabitants in the less botanically explored areas.

Achieving Sustainable Conservation In Madagascar

James S. Miller

Institution: Missouri Botanical Garden

The Missouri Botanical Garden has been sending botanists to Madagascar for 45 years, but the present iteration of the program is now more than 30 years old. More than 100 local full-time employees work in Madagascar on both research and conservation issues. In 2003, following then President Marc Ravelomanana's declaration to triple Madagascar's protected areas, the Garden led an effort to identify Priority Areas for Plant Conservation. 76 Priority areas were identified and the vast majority have been protected, with the Missouri Botanical Garden now

having management authority for 13 sites. Conservation efforts at these sites include efforts to protect existing biodiversity, support for ecological restoration, preservation of local traditional knowledge, and direct community engagement. The majority of sites include nurseries to grow both native trees for forest restoration and useful plants to improve food supply. Efforts also include programs to improve efficiency of farming and sustainable use of natural resources. Numerous collaborating partner institutions are involved, including the Olin Business School at Washington University, a partnership that brings a unique perspective to conservation. Engagement of the local communities living in close contact with these protected areas has proven to be essential from planning stages through execution of every conservation effort. The lesson from these efforts is that if conservation efforts do not improve community members livelihoods they will not be sustainable.

Forest Islands Revisited: Sacred Groves, Inselbergs, And Socionatural Histories In Southern India

Kathleen D. Morrison

Institution: University of Pennsylvania

On March 1, 2019, the Indian Supreme Court ordered a stay of its own decision a month earlier that would have led to the eviction of over a million forest-dwelling people from their homes. The eviction order was filed in response to a lawsuit brought by environmental groups for whom forest protection and human occupation posed a fundamental contradiction. Protecting nature, in this view, requires a complete evacuation of human presence. A somewhat different attitude can be found in scholarship on India's many sacred groves. Protected by a range of deities, sacred groves have often been viewed as examples of a traditional harmony with nature or as evidence of the environmentally-friendly nature of Hinduism. However, both perspectives build on historical misrecognitions. South Asian forests have long been humanized spaces, their complex histories multiply reimagined over time. In this talk, I consider two different biodiversity hotspots, the rocky inselbergs of the Deccan Plateau and the sacred groves of the Western Ghat Mountains in southern India. In case, entangled socionatural histories of humans and local landscapes defy the simple dichotomies that animate contemporary conflicts.

ORGANIZED SESSIONS

Looking To Nature For Cancer Treatments: Conducting And Promoting Life-Saving Research, Panel Discussion Hosted By The Lloyd Library And Museum

Patricia Van Skaik (Chair)

Institution: Lloyd Library and Museum

Since its inception in the late 1870s, Cincinnati's Lloyd Library has fostered nature-based medical inquiry. Established to support the research needs of the Eclectic Medical Institute and the Library's co-founder, John Uri Lloyd, this botanical library continues to serve as a global pharmacognosy resource, housing materials ranging from historic rare books to current leading-edge publications. The world of cancer research is nothing new to the Lloyd Library. As adherents of the eclectic medical viewpoint, the Lloyd brothers collected works that drew from six continents, representing Native American, Chinese, Ayurvedic, Pacific Island and western traditions. These resources often emphasized the natural healing properties of the human body and its interaction with plants. The Library's botanical works show plant-based approaches to medicine dating back hundreds of years. Its archival collections include late nineteenth century papers documenting cancer and the works of leading twentieth century cancer researchers. For more than one hundred years, the Lloyd has disseminated botanical and medical research. The *Bulletin of the Lloyd Library of Botany, Pharmacy and Materia Medica*, a predecessor of *The Journal of Natural Products*, published today by the American Society of Pharmacognosy and the American Chemical Society, is known for its coverage of cancer research. The Lloyd Library provides digital access to its collections and participates in collaborative library sharing. This presentation introduces the Lloyd Library and how definitions and understanding of cancer have changed over time, providing a context for cancer research panelists Drs. Susan Mooberry and Douglas Kinghorn's discussion of their work. Patricia Van Skaik is Executive Director of the Lloyd Library and Museum and known for bringing fresh approaches and historical insights to timely topics. Van Skaik holds Masters' degrees in history from the University of Cincinnati and Library and Information Science from the University of Kentucky.

Discovery Of Anticancer Agents Of Diverse Natural Origin

A. Douglas Kinghorn

Institution: Ohio State University

For more than 50 years, an increasing number of small-molecule organic compounds from organisms of terrestrial and marine origin have been approved as new single-chemical entity (SCE) anticancer agents in western medicine. For example, those derived from higher plants include alkaloids (bisindole, *Cephalotaxus*, and camptothecin types), nitrogen-containing diterpenoids (taxanes), and lignans (epipodophyllotoxins). Many additional representatives from all of plants, terrestrial microbes, and marine organisms currently are under study as potential cancer chemotherapeutic agents. Since 2007, our group has received U.S. federal funding through the program project mechanism for a multi-institutional, multidisciplinary research program directed towards the discovery of new anticancer lead compounds from higher plants (collected mainly in tropical and sub-tropical countries), U.S. lichens and their mycobionts, aquatic and terrestrial cyanobacteria (blue-green algae), and filamentous fungi. This research effort has involved the interaction of isolation chemistry groups at The Ohio State University, the University of Illinois at Chicago (UIC), and the University of North Carolina at Greensboro. Taxonomically authenticated higher plants for the project have been collected in Vietnam and Laos through formal collection agreements with UIC, and the fungi have been provided for the project by Mycosynthetix, Inc. (Hillsborough, NC). The overall project is supported by biological testing, synthetic chemistry and pharmacokinetics, and administration and biostatistics cores. Our efforts have been supported by additional external collaborations with the pharmaceutical industry and others. This presentation will focus on the leads obtained recently from higher plants. In addition to a description of some recent field work in Laos for this project, some of the compounds of interest for additional development inclusive of in vivo biological testing are the lignans phyllanthusmins C and D (from *Phyllanthus poilanei*; Phyllanthaceae), the sesquiterpene lactone, goyazensolide (from *Piptocoma rufescens*; Asteraceae), and silvestrol and other rocaglate derivatives (from *Aglaia* species; Meliaceae).

Investigation Of Plants For New Leads For Triple-Negative Breast Cancers

Susan L Mooberry

Institution: Univ. Texas Health Sci. Ctr. San Antonio

Plants throughout human history have provided therapeutically active compounds that have found utility in the treatment of multiple diseases. Even today, compounds isolated from higher plants remain an unmatched source for new drug leads. There remains significant unmet medical needs for new effective drugs and this is true for many diseases including cancer. We evaluate diverse natural product extracts including plant extracts from Texas plants, the collection of the National Cancer Institute Natural Products Branch, and pure compounds from collaborators across the globe to identify new lead compounds for subtypes of triple-negative breast cancer. Our goal is to identify targeted therapies for triple-negative breast cancers, an aggressive and highly heterogeneous type of breast cancer. Using cell-based mechanism-blind screens of complex extracts we identify initial hits that have selective cytotoxic effects in cell lines representing defined subtypes of triple-negative breast cancer that have distinct driver pathways. Strict bioassay-guided fractionation is used to isolate the active compound(s) with selective effects. To date we have isolated deguelin from *Amorpha fruticosa* based on its effects in breast cancer cells that express the androgen receptor. Diaryloxazoles with selective effects against the same type of breast cancer cells were isolated from *Amyris texana*. Englerin A, isolated from the African plant *Phyllanthus englerii* defined a new subgroup of triple-negative breast cancer cells that are additionally more sensitive to the digitalis glycosides. The biological mechanisms of action of each of these compound classes were defined to potentially uncover new therapeutic targets for these challenging cancers. Our overall goal is to identify potential therapeutic lead compounds and discover new therapeutic targets for the subtypes of triple-negative breast cancer to ultimately provide more effective therapies for these challenging cancers.

Ethics In Ethnobotany

Mark Nesbitt (Chair), Georgia Fredeluces-Hart, Jillian De Gezelle, Cassandra Quave, John Rashford

All the fields of economic botany have the potential for profound impact on people and the environment. All SEB members subscribe to the ISE Code of Ethics (2006), to ensure that our work and its effects are beneficial rather than harmful. It is 13 years since the ISE Code was established, and six since it was adopted by SEB. It is time

for a re-examination: what are the most pressing questions? Do we need to add new principles to reflect a changing world? Above all, practically as individuals and as a profession, what can we do better? This panel discussion will combine the personal experience of panel members with active participation by the audience to try and arrive at some answers.

16th Biocultural Collections Workshop

Mark Nesbitt and Eric Tepe (Chair)

Continuing the series of meetings started by Jan Salick, this workshop is an opportunity for all those interested in the curation and use of economic/ethno- botanical collections to meet. We'll catch up with each other's work, and tour the exceptional medicinal plant and Samoan specimens of the University of Cincinnati Herbarium, collected by Cincinnati pharmacists John, Nelson and Curtis Lloyd in the 19th century.

WORKSHOPS

Seeing Seeds

Sharon Bladholm

We will draw from enlarged seeds subsequently adding watercolor washes, techniques will be discussed and demonstrated. Attendees are invited to bring seeds of their own to work from, plus I will provide actual seeds from my own collection along with photos of enlarged seeds from "Seeds: Time Capsules of Life" and John Janovec's book "Amazonian Seeds." Participants will have a chance to see about 25 species of enlarged ceramic seeds for inspiration plus a Power Point presentation of botanically inspired art. While working, we will discuss the importance of seeds, including issues regarding loss of seed diversity, structure, color, form, dispersal methods and seed banks, both natural and storage facilities such as Svalbard. During the workshop I will share seed stories such as Methuselah, a 2000 year old date palm that is considered the oldest seed to ever sprout, found in Masada, Israel and Native American seed and plant stories. Stories can relay important information in a more memorable and engaging form.

Geography Of Viticulture, Lecture And Wine Tasting

Nicholas Dunning

Wine can be made from any fruit or sugar source. Most commonly, commercially produced wine is produced from grapes, chiefly from varieties of the species *Vitis vinifera*. This species was domesticated in the South Caucasus region some 7,000 years ago, diffused initially throughout the Mediterranean, then globally. Production of *V. vinifera* proved initially problematic in eastern North America, so European colonists and their descendants began making wine from five native North American grape species. Eventually, grafting of *V. vinifera* vines onto North American root stock proved to be the salvation of a 19th century pandemic devastating vineyards in Europe and elsewhere. In this lecture, we will look at the different grape species used to make wine and sample several wines made from native North American grapes, including one that made Cincinnati the wine capital of North America between the 1830s and 1850s. We will also look at how *V. vinifera* is affected by climate, slope, and soil, and sample several pairs of wine that showcase those effects.

Including Pollinators In Traditional Forest Practices And Conservation

Brian J. Dykstra

Pollinators are often keystone species in plant communities, and therefore human communities. Often bees are the primary pollinators, and in most cases indigenous people have a wealth of knowledge regarding the native bees. This knowledge extends into knowledge of plant medicinal properties and phenology. Unique properties of plant resins, nectar, and pollen are often utilized by humans after bees have done the initial collecting/harvesting. Learning objectives:

1. The connection between bee/pollinator diversity, cultural diversity, and plant reproduction and diversity -- and thus human health and well-being, and cultural resilience.

2. Indigenous Peoples' knowledge of pollinators has been documented, and its relevance toward cultural and ecosystem continuity
3. Decline in indigenous pollinators and how this impacts Indigenous People
4. Relevant aspects of governmental, organization, groups report and agreements.
5. Success stories in which revitalization of indigenous beekeeping practices and protection of native pollinators.
6. Group activity: building a conservation model which includes indigenous knowledge of pollinators.

Networking For Applied Ethnobiology-Ethnobotany Practitioners, Professionals, And Scholars

Lisa Gollin, Trish Flaster

Ethnobiologists/ethnobotanists come from diverse fields (botany, anthropology, geography, medicine, nutrition, agriculture, art, architecture, etc.) and possess the knowledge, skills and experience to make critical contributions to: food security and sovereignty, natural and cultural resource management and historic preservation, climate change resilience and adaptation and environmental futures, nutrition, public health and medicine, natural product development and sustainability, wildfire prevention and response, field and methods training and guide writing, to name only a few. This session will expand on the Networking Social event held at the 2017 SEB-SoE joint conference. Come meet with resource professionals who will share their experiences and background in applied work, the cross-over skills in natural-social sciences they bring to their projects, and where they see opportunities for attendees. Introductions and a brief panel discussion will be followed by a group breakout activity. Each resource professional will head a group covering a topic related to the fields, topics, and opportunities open to ethnobiologists/ethnobotanists in the public and private sectors, NGO's and more. Attendees can choose one group or circulate to exchange ideas, build connections, and foster collaborations.

Engaging The Public: Documenting Your Work In Under A Minute!

John de la Parra, Ernest Anemone

With just a phone and a plan, you can make an engaging and informative video of your work! In this interactive workshop, John and Ernest will walk participants through exciting filmmaking tips and tricks, while also covering the fundamentals of producing a short internet-style film for maximum public impact. They will also screen selected submissions for the new SEB Public Engagement Award. Ernest and John co-teach classes on medicinal plants at Harvard University and Tufts University and have spent years documenting their fieldwork on film. In addition, Ernest brings his wide-ranging experience as a professional actor and award-winning filmmaker.

Compiling Tools And Charting The Course: Co-Creating An Ethnobotanical Evaluation Toolbox For The Anthropocene

Jeffrey Wall, Morgan Ruelle, Michelle Baumflek

This engaged, collaborative workshop aims to envision and plot the development of a valuation toolbox for practitioners, students and researchers who aspire to democratize the conservation of plant value worldwide, and who aspire to put indigenous peoples', women's, ethnic minorities' and other muted values for the living world on the biological conservation agenda and to keep it there. Through a series of facilitated exercises, the experiences, skills and foresight of workshop participants will be synthesized to collectively articulate tangible, appropriate strategies and methodologies necessary to address this grand challenge. Goals for the workshop include identifying the necessary capabilities and formats of the valuation tool box, deciding appropriate terminology, and identifying parallel literatures and working frameworks that can and should be engaged.

CONTRIBUTED PAPERS AND POSTERS

A Bundle Of Very Large, Cultigen Amaranth (*Amaranthus* Sp.) Seeds From Dyck Cliff Dwelling, Arizona

Karen R. Adams, Gayle J. Fritz, Todd W. Bostwick, Terrence M. Murphy, R. Kyle Bocinsky, Abby Dockter
Institution: Washington Univ., St. Louis

More than 31,500 uncharred, black amaranth seeds were preserved within a tied-up, rectangular piece of plain-weave cotton cloth at Dyck Cliff Dwelling in the Verde River valley north of Phoenix, Arizona. Direct AMS radiocarbon dates on two seeds yielded results of AD 1021-1165 and AD 1035-1180 respectively, establishing their Southern Sinagua Culture temporal affiliation. Excavated more than 50 years ago, the archaeological provenience was a sealed storage cist. Along with the relatively small quantity of carefully cleaned seeds, this context leads us to infer that they were intended for future planting. Our team is now attempting to identify the seeds to the species level using seed measurements, testa thickness, seed coat texture, morphology of the few flower parts, and ancient DNA. Our efforts so far point to: (1) one or the other of two cultigens, *Amaranthus cruentus* or *A. hypochondriacus*; (2) a hybrid between them; or (3) a cross between one or both of these two cultigens with native weedy/wild amaranths. The morphological variability of amaranths and their proclivity to hybridize present severe constraints, with another limitation being that most previous molecular research focuses on amaranths from Mesoamerica and South America. This study, therefore, sheds light on the history of domesticated *Amaranthus* in the U.S. Southwest and deepens appreciation of the skills of Puebloan farmers and weavers living in the Verde Valley 800-1,000 years ago.

Comparative Analysis Of Four Maple Species For Syrup Production In South-Central Appalachia

Alex Allen, Ryan Huish, Jacob, Dakota Taylor, Ben Munson
Institution: The University of Virginia's College at Wise

Sugar maple (*Acer saccharum* L.) is a key cultural and economic resource from eastern Canada to south-central Appalachia. Environmental uncertainties could create problems for this iconic species, affecting the southern extent of its range in particular, and increasing the need for alternative species in maple syrup production. To mediate uncertainties, some producers tap additional species, including box elder (*Acer negundo* L.), red maple (*Acer rubrum* L.), and silver maple (*Acer saccharinum* L.). For viable marketability, sap from alternative species should be comparable to sugar maple in volume and sugar concentration. In the 2016 and 2017 tapping seasons, data were collected on sap volume and sap sugar concentration (SSC) for each of these maple species. Sap parameter performance data revealed box elder and to a lesser extent silver maple as the most appropriate alternative species for syrup production in the south-central Appalachian region, while red maple, which is a commonly tapped species in northern regions, performed comparably in SSC but very poorly in sap volume in this study. Diversifying the sap sources could provide additional sap and tree counts available to producers, allowing for more varied management strategies to mediate climatic variations and uncertainties. This diversification can also allow for industry expansion into areas without sufficient sugar maples and potentially create a new product niche in the maple industry, all of which can promote rural economic development in south-central Appalachia through means compatible with other agroforestry and outdoor tourism efforts.

Increasing The Sustainability Of White Oak (*Quercus alba* L.) For Use In Traditional Cherokee Basketry

Erika Allen, Lauren Halvorson, Austin Persons, Gabe Crow, James Howell, Sunshine L. Brosi
Institution: Society for Economic Botany

White oak baskets created by artisans are a cultural icon of Appalachia for hundreds of years before the Europeans came to America. These Cherokee basket-makers passed down their traditional wisdom of the natural materials for generations. This tradition began to die in the 1800s and early 1900s but then the Great Smoky Mountain National Park was established. Now this park has brought tourists who want to buy the Cherokee baskets. The baskets have changed in some styles to fit the needs of the Europeans like adding handles and lids. Basket-making tradition became an important source of income for artisans in Cherokee, many of whom are women. The baskets also help to keep the tie between the Cherokee culture and the natural world. White oak trees, *Quercus alba* L., are declining in the forests due to many factors. The increased deer densities have reduced white oak population through deer browse of the saplings. The fire suppression and even-aged forest management are also factors in the white oak decline. To be considered adequate for basketry, white oak must meet several criteria in order to split evenly along the grain of the wood creating straight splits for weaving. Trees

must have reduced branching and slow-growth, and not separate across the terminal parenchyma which divides annual growth rings. My research focused on quantifying the specific wood characteristics of individual white oak trees preferred by basket makers. Once quantified, we would be able to measure other white oaks to determine if they possess the specific characteristics. Specific wood characteristics were evaluated for fifty trees using tree-ring techniques. The trees were cored using an increment borer, the cores were mounted and sanded. The rings of the sanded cores were then measured and analyzed. The annual growth was taken over a thirteen-year period.

Long Term Landscape Dynamics In Northern Albania: Archaeobotanical Evidence From Gajtan And Zagorës From Ca. 4800 BCE To Ca. 200 CE

Susan E. Allen, Martha J. Wendel

Institution: University of Cincinnati

From 2013 – 2015, the Projekti Arkeologjik i Shkodr's (PASH) conducted a regional surface survey and targeted excavation at several settlement and tumulus sites in the Shkodr province of northern Albania. Two settlement sites, Gajtan and Zagor's, are fortified hilltop sites that preserved intact deposits with well-preserved macrobotanical remains (charcoal, seeds, fruit fragments). Gajtan, one of the largest hill forts in Albania, was occupied from the Late Neolithic to the Late Bronze Age. Zagor's was occupied slightly later, in the Eneolithic, continuing into the Hellenistic period. As part of the PASH focus on landscape archaeology, we discuss here evidence from the wood and seeds collected from flotation during the 2014 field season. Riparian forest taxa represented include *Quercus rubra*, *Betula pendula*, *Corylus* sp., *Salix/Populus*, and *Acer pseudoplatanus*, while crop taxa include the cereals *Triticum monococcum*, *T. dicoccum*, *T. spelta*, *T. aestivo-compactum*, *Hordeum vulgare* ssp. *hexastichum*, and *Panicum miliaceum*, and the pulses *Lens culinaris*, *Lathyrus sativum*, *Vicia ervilia*, and *Vicia faba*. Analysis of this material provides insight into landscape dynamics, land use practices, and plant use during these periods, revealing adaptive and resilient strategies.

Satellite Remote Sensing Analysis Of Vegetation In The Ancient Maya City Of Yaxnohcah, Campeche, Mexico

Mariana Teresa Vazquez Alonso, Christopher Carr, Hannah Clements, David Lentz

Institution: University of Cincinnati

For more than a thousand years the ancient Maya built great cities in the central Maya Lowlands. But then, by 900 CE, they were largely abandoned. What can we learn from their successes, and from their failures? This poster reports on our ongoing investigation of forest structure around the ancient Maya city of Yaxnohcah in southern Campeche, Mexico. The present forest structure contains clues to the forest, and agricultural potential, at the height of the Maya success. As the site is located at the relatively undisturbed forest inside the Calakmul Biosphere Reserve, the modern forest will aid us in understanding the past landscape management. This research seeks to understand the landscape surrounding the ancient city, by estimating the available resources and the Maya approach to forest management via the plant species they used. To characterize vegetation types in the site of 24 km², we analyzed the forest using ground surveys coupled with Geographic Information Systems. The tropical environment makes current fieldwork difficult and expensive. Sensors in satellites (and on airplanes) enable us to examine larger areas than we could on the ground, allowing us to be more efficient. From satellite images, we can distinguish great variability in the spectral signatures, indicating the diversity of tropical forest cover. For our initial analysis, we used an isodata clustering algorithm to group data from the Landsat 8 satellite into four classes. Based on quantitative surveys of forest transects, we preliminarily assigned the four classes to the vegetation types: upland forest, transition forest, seasonal wetland forest, and aquatic habitats. We completed 56 transects, sampling a total area of 2.8 hectares. From them, we collected 327 botanical samples. After their identification, we found 163 species belonging to 52 families.

Teaching Ethnobotany By Learning From Cannabis: Toward A Better Model Of Understanding Medicine And Law

Ernest Anemone

Institution: Harvard University and MIT Media Lab

For centuries, indigenous healers have employed the polypharmaceutical effects of herbal medicine. Cannabis has been no exception. However, Western medicine has developed an attachment to the single-compound-

single-target model of drug development. While this model has led to many exciting discoveries, it has paradoxically hindered many others. Are plants, like humans, more than the sum of their parts? How far should researchers and consumers force botanical medicine to fit this model? As we begin to understand more and more about the limitations of this model, not only for Cannabis, but other botanical medicines, we have the opportunity to gain a better understanding of plants, society, and even our own bodies. Cannabis in particular provides an interesting case study for teaching ethnobotany and examining our relationship to plants because of the racialization and stigmatization it has endured, all the way back to its taxonomy. Eventually, in the West, and by extension wherever the West could exert its influence, Cannabis was used as a proxy to suppress not so much what the plant was but everything it came to represent. Over time, Cannabis was just one of many indigenous medicines that began to disappear from Western pharmacopeias--usually without much investigation. But, the questions raised by the legalization of Cannabis, and moreover its commercialization, are re-engaging us with the fundamental questions of what it means to be human and use plants to survive.

Importance Of Degraded Vegetation And Wild Plants In Traditional Herbal Medicinal

Alex Asase

Institution: University of Ghana

The majority of human populations in developing countries rely on traditional medicines. Here, the author investigated indigenous uses of herbals by communities living around Apra Hills Sacred Grove. A total of 75 households living in the study area were interviewed about the plants they used for the management of their common human ailments. Data collection was achieved after obtaining prior-informed consent, and using a semi-structured questionnaire, and collection of voucher specimens. A total of 31 species of plants belonging to 16 families were reported as being used in the management and treatment of diseases. About 65% of the plants were collected from degraded vegetation whereas 35% were obtained from the wild. The majority (81%) of the plants reported were non-cultivated plants while 19% were semi-cultivated plants, and none were cultivated. Leaves formed a major component (57%) of the plant materials being used. The study results have confirmed importance of degraded areas as a source of medicinal plants for indigenous communities, and that a high proportion of non-cultivated plants is used for such medicines. The implications of the findings are discussed about health care and conservation is discussed.

An Archaeobotanical Analysis Of Site 40DV7

Holly Aslinger

Institution: Middle Tennessee State University

This poster presents a thesis regarding archaeobotanical data collected from the Late Archaic and Middle Woodland Site 40DV7 in Nashville, Tennessee. Over the course of five chapters, it emphasizes the importance and relevance of this data to the archaeology of the American Southeast, analyzes the data using archaeobotanical methods as described by Pearsall (2000), and provides context for the data not only through research of Southeastern archaeobotany, but also through information regarding climate change and mobility patterns. *Carya* sp. is particularly prevalent throughout the data, as well as other genera of the Juglandaceae family. However, various other plant families are present in the data and, despite their underrepresentation, could suggest that intentional plant cultivation was taking place at or around Site 40DV7 during its Late Archaic and Middle Woodland use.

Ecological Footprint And Sustainability Aspects Of Commercial Medicinal Plants Harvest In District Swat, KPK Pakistan

Hazrat bilal, Hassan Sher, Muhammad Ibrar Shinwari, Rainer W Bussmann

Institution: International Islamic university Islamabad

Environmental and ecological stability has been compromised in many countries as a result of increasing demand and commercial use of medicinal plants. Un-sustainable harvesting has substantially challenged survival of medicinal and aromatic plant species and hence has a direct impact on the people dependent upon them for their daily livelihoods. Un-controlled urbanization and soaring demand has generated a dynamic trade of medicinal and aromatic plants in District Swat, but the ecological aspects of this activity have not been studied yet. To understand consequences of commercial harvest, we designed a market survey and observed commercial harvesters in the wild to investigate the symptoms of over or destructive harvesting. We examined three

perspectives: herbal market, collectors and post-harvest survival of target species. Of 70 commercial species, more than half (69%) were found harvested exclusively from the wild, which resulted in a considerable decline of resources in the wild. Very few (7%) were found to be cultivated. Our three-way investigation allowed us to differentiate among species having no sustainability issues (cultivated, abundant, narrow market value, domesticated) and species with conservation urgencies. Species like *Acorus calamus*, *Podophyllum hexandrum*, *Trillium govanianum*, *Morchella esculenta*, *Paeonia emodi*, *Aconitum violaceum*, *Bergenia ciliata*, *Valeriana jatamansi*, *Viola biflora* were found to be struggling for survival. Our research demonstrates that amplified commercialization of these medicinal plants as a result of urbanization is playing a vital role in the decline of resources and species loss. The economic value of specie was also found to have a considerable impact on the survival of plant species (i.e. in case of *Trillium govanianum*, *Viola biflora* and *Morchella esculenta*) which are collected from wild sources unsustainably in bulks to increase economic benefits, reducing their post-harvest regenerating ability thus compromising their survival. Thus district Swat should be considered a priority zone for medicinal plants conservation.

Pine/Palm “Plantations” And “Heirloom” Trees: Carbonized Wood Remains From The Matacanela Site, Veracruz, Mexico

Renee Bonzani

Institution: University of Kentucky

This presentation describes the carbonized wood remains recovered from light and heavy fractions of flotation samples recovered during the archaeological excavations of the Matacanela Site in Veracruz, Mexico. Differences in the use of wood taxa from the Middle Formative (BCE 634) to Late Classic (CE 800 to 900/1100) time periods are presented and data indicating a concentration on the use of pine (*Pinus* spp.) and other palm and fruit trees are noted for the Early Late Classic (CE 710, CE 765, CE 772) at this site. Shifting wood and tree use strategies and potential reasons for this occurrence are discussed. Environmental comparisons are briefly made to the forest composition in the natural reserve at Los Tuxtlas (la Estación de Biología Tropical Los Tuxtlas) and ethnobotanical uses of the identified wood taxa are briefly discussed based on information from the Huastec Maya from the northeastern part of Mexico within the states of Veracruz and San Luis Potosí (Alcorn 1984: 747-748).

Neither Wild Nor Cultivated: American Ginseng (*Panax quinquefolius* L.) Trade Surveys In Pennsylvania, U.S.A., Provide Insights Into Husbandry Of An Internationally Traded Non-Timber Forest Product.

Eric P. Burkhart

Institution: Penn State University

Pennsylvania is one of nineteen states in the United States of America (U.S.A.) that exports wild American ginseng (*Panax quinquefolius* L.) roots to Asian countries where the species is used medicinally. This study utilized a confidential annual survey instrument over a seven-year period (2012-2018) to gather information from sellers regarding ginseng husbandry behaviors that might influence reported trade volumes in Pennsylvania. Results indicate that a variety of husbandry practices are used to produce ginseng which ultimately is sold and traded as “wild,” ranging from intensive agroforestry (e.g., “forest farming”) to enrichment plantings. As many as one-fifth of sellers indicated that the ‘wild’ ginseng sold originated from intentional planting on forestlands. This scenario presents a dilemma regarding interpretation of “wild” harvest data because current industry reporting mechanisms are in many cases insufficient to accommodate the complex range of husbandry practices being utilized, and which often result in “wild” appearing roots. Seller/producer concerns and misgivings about issues such as price gouging, theft, taxation, coupled with a lack of consensus around what constitutes “wild,” collectively drive much of the secrecy around forest-based husbandry and cultivation of this important non-timber forest product.

An Analysis of Carbonized Botanical Remains from the Ancient Maya Center of Yaxnohcah

Hannah Clements, David Lentz

Institution: University of Cincinnati

Yaxnohcah is a large-scale ancient Maya settlement in the center of the Yucatan Peninsula that sustained human populations from the Preclassic period (700 B.C.-A.D. 250) until its abandonment in the Terminal Classic (A.D. 850-1000), yet the exact land use methods implemented by the Maya to sustain their inhabitants are unknown.

The ability of the Maya to provide food and water resources in the midst of the Neotropical lowlands has been partially credited to the settlement's proximity to various *aguadas* (ponds) that lie adjacent to corresponding *bajos* (seasonal wetlands). In other Maya settlements, these geographical relationships have been indicative of nearby agricultural zones. To investigate how the Maya interacted with their environment, carbonized botanical samples have been collected from various middens within Yaxnohcah. Using scanning electron microscopy, woody species have been identified and are recognized to have been utilized by the Maya based on the species identified, the ethnographic record, and the contexts from which they were obtained. Future analysis of the site will attempt to further elucidate the uses of these and other woody species by the ancient Maya.

The Future Of Ethnobotany: From Indigenous Intelligence To Artificial Intelligence

John de la Parra

Institution: Harvard University and MIT Media Lab

What will the future of ethnobotany look like? From food security to enhanced phytopharmaceutical production, cutting edge innovations will be increasingly necessary in our rapidly changing global environment. Advances in artificial intelligence and biotechnology are beginning to play particularly important roles in the future of plant-human interactions. Alongside those innovations, we are also finding that indigenous knowledge has much to offer. Populations of farmers and healers around the world have long recognized that plants undergo constant chemical warfare in order to survive in their environments, thus changing the quality and production of important plants of human use. These observations can richly benefit some of the most exciting advances in plant science and agricultural techniques. But how can we best understand how environmental influence impacts the human use of plants and how can we harness this for maximum benefit? The coming digital agricultural revolution will change farming forever with the use of artificial intelligence and biotechnology, but will offer the most benefit when indigenous knowledge is preserved and respected. This presentation will discuss 1.) how biotechnology and artificial intelligence, particularly when influenced by indigenous knowledge, present new paths for innovation 2.) what we can learn about improving crop quality and production from a plant's environmental interactions.

A Bibliometric Review Of Ethnobotanical Studies In Turkey

Ozgur Kivilcan Dogan

Institution: Marmara University

Turkey as a developing country, both culturally and geographically is a bridge between Europe and Asia. The plant diversity and the traditional folk structure have provided a great opportunity to use the plants in the treatment of diseases. As scientists in the rest of the world, the rapid developments in the field of pharmacology in the last 50 years has turned the attention of Turkish scientists to this field. Consistent to this idea the purpose of this study was to determine most influential articles (those are with highest citations) and to identify research trends in this field in Turkey. Current study employed bibliometric methods in order to examine relevant features of pharmacology literature. Scopus, Elsevier's abstract and citation database, were used to reach relevant articles in the field. We searched articles to reach bibliometric data via keywords; ethnopharmacology, ethnopharmacological, ethnobotany, ethnobotanical, ethnomedicine, ethnomedical, medicinal plant, folk medicine, traditional medicine. Additionally, we exclude all countries but Turkey. Total number of articles published in Turkey were 2141. Initial analysis showed that 66% of the studies (1148) were published in last decade. Once we got to all articles we sorted them by citation counts from highest to lowest and choose the first 200 hundred of them to analyzed and mapped in VOSviewer software. Most cited articles were contributed by a total of 607 authors. Analysis showed that there were 18 terms appeared in five or more articles. The most occurred keyword was 'antioxidant activity' with the 35 citation and '2,2-diphenyl-1-picrylhydrazyl' (12) and 'antimicrobial activity' (11) were the 2nd and 3rd keywords respectively.

An Ethnobotanical Review Of *Laurus nobilis*: Apollon's Beloved Daphne

Şule Doğan, Gizem Bulut, Ahmet Doğan, İsmail Şenkardeş

Institution: Institution of Health Sciences, Department of Phar

Turkey has a very rich flora regarding aromatic plants, *Laurus nobilis* L. (commonly known as Defne in Turkish and Laurel or Bay Tree over the world) is one of these important aromatic plants. It is a small, aromatic, evergreen tree or shrub belongs to Lauraceae family. The plant is native in the temperate and humid regions of Mediterranean area including Turkey and it naturalized along the Atlantic coast of Europe, western France and

North America through cultivation. It also grows well in the northern parts of Turkey showing the Mediterranean climate characteristics. In Greek-Roman mythology, the plant is a figure of Apollon's unresponded love "Daphne" and laurel wreaths symbolize victory which worn by winners and poets as a chaplet on the head. Bay tree is widely used by local people in Turkey and it is an important financial return for them. According to 2018 statistics, 14600 tons of bay leaf has been exported and this makes Turkey the leading country of the export of bay leaf among all world countries. In this research, we assessed the ethnobotanical uses of the plant in Turkey through our investigations and scientific literature. The ethnobotanical data was obtained by open-ended and semi-structured interviews with the local people. According to our results, it was mostly seen that leaves have been used as a seasoning in meat, fish dishes and pickles. In medicinal purposes, mainly, essential oil and decoction of the fruits have been used for skin ailments and infusion of leaves has been used for respiratory system diseases. Soap made by laurel oil has been used for cosmetic purposes of hair care. Furthermore, it was observed that leaves have been used as a repellent against insects. They are also placed on graves as a sacred plant.

A Shaded Understory: Interacting With Associated Species In Trinidadian Cocoa Agroforestry

Madeline Donald

Institution: Wageningen University

This is a case study of plant use in the cocoa (*Theobroma cacao*) agroforestry systems (CAFS) of Trinidad. It asks, who uses which plants and for what purposes? Commercially cultivated lands are, by definition, monetized. There is however, non-commercial engagement with plants in these CAFS. This study was an inquiry into what forms that engagement took, and how it contributed to quotidian practices in the field and general lifeways for workers, farmers, and people in the surrounding communities. Using ethnobotanical methods a record of 116 plant species used for 220 different purposes was catalogued. The stories of these 220 "use cases" form the basis for a theoretical framework. Two perspectives on landscape, *potential for production* and *potential for thriving*, are outlined and used in conjunction with the *socio-material landscape of affordances* as a way to interpret the importance of non-crop plant use in cocoa agroforestry systems. Imagining what it would mean to enrich the cultivationscape of affordances presents a new way of conceptualizing the sustainability of cocoa production. A way in which worker, farmer, and community well-being are the foundation of sustainable cultivation. Land-based knowledges, access to non-crops, and biodiversity are shown to be inseparable factors that must be prioritized.

Bioactivity Of Plants Used As Cosmetics In The Ecuadorian Amazon

Brian Doyle

Institution: Alma College

Plants have historically served as the basis for cosmetics, and botanical ingredients remain a critical part of the cosmetics industry today. Essential oils are used in perfumes; waxes and fixed oils are used in balms, lotions and hair products; and pigments are used in makeup. Many of these phytochemicals are biologically active and have anti-microbial, anti-inflammatory, wound-healing, and UV-protectant properties, among others, that may provide health benefits in addition to their aesthetic value. The cosmetics industry continues to search for new biologically active botanical ingredients, with a particular interest in plants with a history of traditional use in regions of the world considered to be "exotic", such as the Amazon Rainforest. As part of a larger survey of medicinal plant use in the Kichwa community of San José de Payamino in the Ecuadorian Amazon, we documented the use of plants as cosmetics by women in the community. Seven species were documented, three of which are used as shampoos to make the hair shine. Other uses include lipstick, nail polish, and makeup. Only one plant, which was used to treat acne, was cited for its medicinal properties. Two species, *Bixa orellana* L. (Bixaceae) and *Vismia* sp. (Hypericaceae), are noteworthy for having biological activity reported in the literature that is relevant to their cosmetic use. *B. orellana* is a well-known red dye that has anti-bacterial and anti-oxidant properties, among others, and is widely used in both food and cosmetics. Various plants in the genus *Vismia* produce a yellow to orange latex that has anti-fungal properties. *Vismia* remains a relatively unexplored cosmetic plant, and further investigation may lead to the development of new phytocosmetics with health benefits for users as well as financial benefits for indigenous communities such as San José de Payamino.

Globalization And Tradition: Ethnobotanical Case Study In A Rural Village In Bhutan

Maria Fadiman, Ngawang Gyeltshen, Chris Rainer, Olivia McKendrick

Institution: Florida Atlantic University

Bhutan, known for its Gross National Happiness, proves to be more interesting than the image portrayed. This paper is part of a project stemming from work with the group Cultural Sanctuaries, whose mission is to: "Écreate a global series of cultural sanctuaries that support the work of traditional and indigenous communities". The study site, Rukha village, located in the buffer zone of Jigme Singye Wangchuck National Park in Bhutan, is surrounded by forest and the residents are the last Olep speakers in the country. Their culture and their ecosystem are poised in a moment of change, as a road is being built connecting from the main highway to the village, with the increased potential of deforestation and cultural degradation. As times change, so do the people and their knowledge and traditions. This paper represents the ethnobotanical part of the project, working with a larger team made up of linguists, anthropologists, photographers and cultural mediators. Through participant collaboration we recorded and analyzed useful plant species in the categories of medicine, tea, food, transport, construction, ornamentals and spirituality. Plant names are recorded in Zhonka, Olep and the scientific name. This data is used as a lasting record for the people of Rukha, as well as creating a data base for the Royal Government of Bhutan and the Tarayana Foundation to provide cultural ecological data to provide a basis on which to create a Cultural Sanctuary. Surprising results reveal themselves as a culture is on the brink of a new connection to the outside world, as outside influences prove to already be incorporated into their traditions.

Culturally Important Plants Of The Lakota At Wind Cave National Park, South Dakota, USA

Deanna Eagle Feather, Lisa Iron Cloud, Linda Black Elk, Arlo Iron Cloud, Leroy Iron Cloud, Sunshine L. Brosi

Institution: Society for Economic Botany

As part of the new modified Plant Gathering Rule members of Federally Recognized Tribes may petition for permits for collecting plants for traditional purposes from National Parks. After IRB approval 25 individuals from the Rosebud Tribe, Lakota were interviewed about the plants that they would prefer to collect from Wind Cave National Park, South Dakota, USA. Information from these interviews including traditional ecological knowledge around sustainable plant collection was analyzed and compared across generations and gender. This information can be used to petition for permits for plant collection. The focus on this project is in including human landscape legacies in active management of areas which have been off-limits since the establishment of the National Park Service.

Sex Expression And Floral Variability In The "Food Of The Gods", *Diospyros virginiana* (Ebenaceae)

Margaret Flowers, Deserre Johnson, Mirabai Moseley, Patrick Wilson, M Henry H Stevens, Nanci Ross

Institution: Drake University

Variation in floral structure for animal-pollinated species is believed to decrease evolutionary fitness in fruit producing species. However, changes in reproductive systems is a common impact of artificial selection in dioecious fruit trees. We investigated variation in floral morphology and sex expression among wild and cultivated American Persimmons, *Diospyros virginiana* (Ebenaceae). Floral morphology evolved to maximize reproductive success, especially in animal pollinated species; so the expectation exists that there would be low variability in sex expression due to stabilizing selection. Despite extensive genetic studies of persimmons, there has been little work done on the floral morphology of American persimmon. We quantified variation in 12 morphological characters in over 300 flowers from wild and cultivated American persimmon trees to investigate the interactive effects of natural selection in biotically pollinated dioecious flowers and artificial selection for increased fruit production. This project is part of a larger study on the biogeography of reproductive diversity in American persimmons and the evolutionary implications of historical human selection in economic species.

Kanza Subsistence Patterns And Cultural Change 1724-1873

Morgan Fluker

Institution: University of South Carolina

The Kanza Indians resided in the northeastern corner of what is now Kansas in the Midwest region of the United States during the late seventeenth century until 1873 when they were removed to Indian Territory. They remained mobile while in Kansas, annually travelling between their hunting grounds and sedentary villages. Through the

use of ethnohistorical research focusing on the Kanza use of natural resources, I have assembled a tentative timeline of the Kanza tribe's settlements and movements through northeastern Kansas. An emphasis was placed on native plants harvested near the village, and wild animals hunted at each location. I originally hypothesized that the resources associated with the villages would change with each new location. I discovered, instead, that native resources utilized were consistent while the tribe resided in northeastern Kansas due to the Kanza people's knowledge of the land and choice of village locations.

Ethnoecosystems Of The Carpathian Mountains: Roots And Future Implications

Nina Fontana

Institution: University of California Davis

Considered the “Amazon of Europe”, the Carpathian Mountains are one of Europe's last fully undeveloped landscapes, a rich habitat for over 200 endemic plant species, and a principle source of subsistence to 16 million people. This is a dynamic, partially domesticated ethnoecosystem maintained by indigenous Hutsuls, a forest-dependent community in the Carpathian mountain region of Ukraine. This ethnoecosystem presents an alternative form of cultivation in the wide variety of globally recognized food production strategies. For centuries, Hutsuls have creatively managed non-timber forest products (NTFPs), maintaining their productivity and availability, thus creating a socioeconomic safety net to sustain them in times of scarcity. As Ukraine faces political crises, financial insecurity, and increasingly expensive medical care, direct consumption of NTFPs in local diets and trade of NTFPs have increased in the Carpathian region. Additionally, this bioculturally rich region and its people are encountering ecosystem change surrounding decline in forest health through high levels of deforestation and habitat degradation. Secondly, climate change effects seem to be synergistically interacting with various ecosystems through changes in the hydrological cycle and uptick of extreme weather events, such as flooding. By exploring traditional ecological knowledge (TEK) of the Carpathian Hutsuls, specifically the management and uses of wild edible plants, vital insights can be gained to inform land stewardship policy and conservation. My intention is to present preliminary data on the following question: How do Hutsul communities manage and use wild plants? My objective is to co-create an ethnobotanical database and eco-cultural reservoir with Hutsul communities to provide better insight into how groups construct, communicate and amend local knowledge in response to ecosystem challenges.

Modeling Future Biocultural Scenarios Of Beargrass Use In Pacific Northwest Forests

Georgia Fredeluces-Hart, Tamara Ticktin

Institution: University of Hawai'i

In our rapidly changing world, statistical models provide an opportunity assess the potential consequences of different courses of action. Changes to fire severity and frequency, and to climate are major drivers of ecosystem change. In many areas, changing fire regimes are partially a consequence of the exclusion of traditional fire as practiced by local and Indigenous Peoples. This project explores resilience of social-ecological systems under changing conditions through a case study of an understory herb called beargrass (*Xerophyllum tenax* Melanthiaceae). To identify adaptive practices and to gather recommendations for biocultural revitalization of beargrass traditions, I interviewed weavers and cultural practitioners. To understand how plants are responding to changes in management overtime, I conducted a field study, and used the data to build integral projection models (IPMs). With these IPMs, I simulated stochastic beargrass population growth rates under different conditions. From the ethnographic study, I found that adaptive practices such as spatial shifts in management focus, and management substitutions in the absence of fire have helped maintain traditions over time. In the simulations, I found that re-introduction of traditional fire regimes and traditional leaf harvest led to population growth, while changes in precipitation predicted with climate change had little impact on population dynamics. These results point to the key opportunities to support biocultural conservation through re-introduction of fire and cultural leaf harvest. They also suggest that resilience of beargrass traditions is tied to plant demographic traits and adaptations, the cultural values of respect and reciprocity embedded in beargrass traditions, and the ability to innovate management techniques in the absence of fire.

Herbal Teas Used As Both Food And Medicine: Case Study From China

Yao Fu, Jin-chao Yang, Yu Zhang, Jian-wen Li, Xuefei Yang

Herbal teas defined as water infusions or decoctions of plant ingredients other than *Camellia sinensis* have been widely consumed globally with long cultural traditions. In China, herbal teas have been considered as both recreational drink and medicine. There are more than 800 plant species used as herbal teas in China, of which Leguminosae, Lamiaceae, Compositae are the most commonly use families. More than 30 types of traditional healthcare uses were reported including clearing away heat, relieving toxicity, used as a tonic (for strength, health or keeping fit) and promoting digestion. There are distinct regional differences in herbal tea consumption in China. Local people live in humid forest area of southern China use to drink “cooling herbal teas” to treat ailments induced by “internal heat”, while people live in desert dry area of western part of China prefer to drink aromatic medicinal teas for nutrient improvement and promoting digestion. It is vital to systematically document the traditional knowledge of Chinese herbal teas as important living cultural heritage to understand human-plant interactions in the context of food-medicine continuum. It also provides insights for pharmacological research and as basis to develop novel healthcare products.

Medicinal Plants Used By Traditional Medicine Practitioners To Boost The Immune System In People Living With HIV/AIDS In Uganda

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People living with HIV/AIDS widely use medicinal plants, mainly for boosting their immunity and treating opportunistic infections. The aim of this study was to document the medicinal plant species and practices used by traditional medicine practitioners (TMP) to boost the immune system of immuno-compromised persons living with HIV/AIDS (PLHIV) in Uganda. Using an Ethnobotanical study, 90 traditional medicine practitioners from eight districts were interviewed using questionnaires. Semi-structured interviews were conducted to gather information on the plant species used. Data were analysed using percentage frequencies. Seventy-one medicinal plant species from 37 families and 64 genera were identified. Trees formed 38.0% of the plant species used, followed by herbs (35.2%) and shrubs (19.7%). Leaves (35.6%) were the most used plant parts, then, bark (24.1%) and roots (20.7%). The most frequently used plant species by frequency of mention were. *Psidium guajava* and *Zanthoxylum chalybeum*, *Warbugia ugandensis*, *Acacia hockii* and *Bridelia micrantha*, *Mangifera indica*, *Markhamia lutea*, *Aloe vera* and *Erythrina abyssinica*. Most TMP (84.4%) encouraged their patients to use their herbal medicines together with antiretroviral treatment. Being infected with HIV was used as a proxy indicator for immunosuppression by the TMP. Although the TMP were knowledgeable on the signs and symptoms of the HIV infection, 89.9% relied on self sero-status disclosure by their patients. The plant species documented in this study were generally given to restore or boost the immune system, treat general malaise and improve appetite. A literature review indicated that 22 of the 71 plant species (31.0%) have immunomodulatory properties, whereas the rest of the medicinal plants have other beneficial uses especially in PLHIV. In conclusion, the TMP have a wide repertoire of knowledge on medicinal plants they consider useful in restoring the immune function and offering relief from the side effects of antiretroviral drugs.

Phylogeny Reveals Patterns Of Non-Random Medicinal Plant Selection By Local People

Orou Gaoue, Kowiyou Yessoufou, Ledile Mangka, Fifanou Vodouhe

Institution: University of Tennessee Knoxville

Ethnobotany, the science of human-plant interactions, has for long focused on documenting the traditional knowledge that humans have developed and accumulated over centuries towards plant uses. However, how these knowledge have been developed remains poorly understood. To uncover this mystery, a number of hypotheses have been formulated recently to explain the mechanisms behind human-plant interactions. Here, we tested the non-random hypothesis of medicinal plant uses in Benin, a western African country of roughly 3,000 plant species, combining various statistical models (negative binomial model, log-transformed model, and non-transformed) and phylogenetic comparative method. As previously reported in many other studies, we found

evidence for taxonomic and phylogenetic nonrandom selection of medicinal plants. We, however, call for caution with regard to the log-transformed and non-transformed models generally used for such test, as we found that these models could inflate the proportion of over-used taxa. Why some taxa are more preferentially used than others for medicine in Benin? Our analysis reveals a potential link with the optimal defense theory as we found that the plant organs used for medicine are also not random selections. Key organs for plant survival produce secondary compounds aimed primarily to defend the plant, and these compounds made these organs/plants particularly sought after by human for medicinal purpose. Because similar organs of closely related species are likely to produce similar compounds, the non-random organ selection for medicinal purpose becomes evident.

Seeing The Amazon Rainforest Through Maijuna Eyes: A Collaborative Cross-Cultural Model For Field-Based Teaching And Learning

Michael Gilmore, Andrew Wingfield

Institution: George Mason University

This poster will showcase a field course offered by George Mason University in collaboration with the Maijuna indigenous group of the Peruvian Amazon. The authors worked directly with the Maijuna to develop curriculum focused on their culture and traditional ecological knowledge (TEK) as well as their biologically diverse ancestral forests. Curriculum and hands-on activities have been developed around innovative community-based conservation and sustainability initiatives in Maijuna lands focused on traditional agriculture, sustainable palm fruit harvesting, traditional handicraft production, and native stingless beekeeping, among others. During the field course, Maijuna elders and leaders serve as co-instructors teaching undergraduate and graduate students, offering students a rare opportunity to learn directly from indigenous people who are actively fighting for cultural survival as well as the conservation and sustainability of their ancestral lands. With fewer than 500 individuals, the Maijuna are one of the smallest and most endangered indigenous groups in Peru and they live in one of Earth's most biologically rich places. Against steep odds, the Maijuna successfully fought to end logging and poaching in their lands. With the help of allies, in 2015 they pushed the Peruvian Government to officially protect over 391,000-hectares of their territory (an area 22% larger than Yosemite National Park). These victories are unique given that most indigenous cultures and lands in the Amazon basin are under siege. As part of this curriculum development initiative, extensive assessment of student learning outcomes has been completed. Also, focus groups have been conducted with Maijuna instructors to evaluate and monitor their perceptions of student engagement, course content, and overall course success. Results will be shared as well as lessons learned for optimizing the development of field-based courses with indigenous communities.

Diet and Plant Use in Marketplaces at Yaxnohcah, A Preclassic Maya City

Alexandra Golden, David Lentz

Institution: University of Cincinnati

Yaxnohcah, a Middle Pre-Classic (900 BC-AD 150) Mayan city in the southern Yucatan Peninsula of Mexico, contains a number of public structures including pyramids, plazas, and markets. Studying these marketplaces provides a unique opportunity to learn about the kinds of foods grown at Yaxnohcah, as well as potentially the foods traded within the region and between city-states. Yaxnohcah contains multiple marketplaces, so one key research question will be determining if there is a difference in the kinds of goods available at different markets within one polity, potentially based on status of nearby residents. Sample collection via flotation in the field provides the raw data, and identification of plant remains is conducted via inspection under a microscope and photography with an SEM. Data analysis is still undergoing, but we hope to find differences in the kinds of foods found in the markets, with the larger market potentially containing more varied plant remains. Going forward, I hope to have another field season, at which I would conduct phosphate mapping of the marketplaces and compare the density of organic remains observable through this technique.

Habitat Suitability Modeling Of Culturally Important Plants At Wind Cave National Park

Elizabeth A. Green, Linda Black Elk, Isabel W. Ashton, Sunshine L. Brosi

Institution: Frostburg State University

Spatial plant habitat models have been used for several applied conservation projects including finding new locations of rare, threatened, or endangered plants and understanding the spatial distribution of plants across a specific management area. This project created habitat models culturally important plant species in Wind Cave

National Park in southwestern South Dakota. We used Mahalanobis Distance (D^2), Generalized Linear Models (GLMs), Generalized Additive Models (GAMs), Maximum Entropy (MAXENT), and Random Forest (RF) to discern where target plants are probabilistically located, the importance of habitat layers to plants, and to estimate of the percent of WICA that is considered suitable habitat. MAXENT models performed with greater accuracy and lower false positive rates than D^2 models. As expected, more specialist plants such as blacksamson echinacea (*Echinacea angustifolia* DC. var. *angustifolia*) modeled with lower false positive rates (26%) and higher accuracy (65%) than species with more general habitat parameters such as breadroot scurfpea (*Pediomelum esculentum* Pursh) with a false positive rate of 40% and accuracy of 58%. Transformation of aspect was consistently the most important habitat variable in RF and MAXENT models grouped by family. We incorporated the models into a proposed Vulnerability Index which attempts to ascertain the potential risk of harvesting to target plant populations based on a variety of accessibility factors, life strategies, and ecology specific to each plant. Vulnerability Index analysis allows for a higher specificity than documented rarity within WICA boundaries. For instance, prairie rose (*Rosa arkansana* Porter) ranked as significantly more vulnerable than fringed sagewort (*Artemisia frigida* Willd.) when both are documented as abundant. Through the combination of habitat suitability and vulnerability analysis, WICA will be able to more effectively manage important ethnobotanical resources.

Go Green-Collar: A Longitudinal Study Of Employment Motivation Within Public Horticulture

Mandy Hansen

Institution: University of Kent

The Gardener's Labyrinth, printed in 1577, is the first published use of the word 'gardener' to describe a paid profession within the United Kingdom (UK). Over the past four-centuries gardening related industries have become a major part of the nation's identity. An estimated 87 percent of UK households have a garden¹, resulting in £1 in every £100 of household income being spent on garden goods. In 2016 11.9 million inbound tourism trips (32 percent) included at least one or more visits to a park or garden, and in 2017 the ornamental horticulture industry contributed over £24 billion to the UK's GDP². While these figures are impressive, the horticulture industry is currently experiencing a burgeoning employment gap that is a significant threat to its future strength. The primary objective of this research is to determine what motivates people in the UK to pursue careers within the Ornamental Horticulture industry. By conducting structured interviews with horticulturists currently employed by the Royal Horticultural Society (RHS) an attempt will be made to discover the key motivations of horticulture related employment amongst three age demographics: early career aged 18-34, middle career aged 35-51 and late career aged 52-68. Collected data will be analysed via cultural consensus theory to identify any universal factors that motivate horticultural employment. If motivational provocations exist than understanding them could be helpful a foundation stone for new and existing capacity building initiatives, educational programs, and industry recruitment endeavours such as *Horticulture Matters* launched by the RHS, and the *Seed Your Future* campaign launched by Longwood Gardens and the American Society for Horticulture Science.

Hosting The Mountain: Naxi Courtyard Gardens As Repositories Of Himalayan Flora

Robbie Hart

Institution: Missouri Botanical Garden

From the summits of Yulong Mountain, in Southwest China, elevation drops almost 3000m to Lijiang Valley in <20km. The diverse habitats along this gradient support superlative plant richness and define the heartland of the indigenous Naxi people. Plant culture has long been a center of Naxi domestic life, as families cultivate a microcosm of the area's floral diversity in lush courtyard gardens. We documented the identity, origins, nomenclature and uses of Naxi courtyard garden plants in 60 households along an elevational gradient to address how indigenous plants, uses, and names are interwoven, whether wild collection drives use patterns, and how urbanization affects botanical and ethnobotanical composition. Our results show that while historical events and new plants and practices have driven changes, Naxi gardens remain repositories of the unique local flora. These patterns of use inform theories about how ethnobotanical knowledge is generated, conserved and transmitted across the Himalayan region.

From Mountain To Market: Exploring Markers Of Quality And Identification Of *Lavandula* Spp. And *Thymus* Spp. Through The Moroccan Supply Chain

Meghan Henshaw

Institution: University of Kent

The High Atlas Mountains of Morocco support a diverse range of medicinal plants rich in essential oils that flourish in the arid growing conditions. These aromatic plants pass through many hands as they are harvested, sold to local cooperatives and travel to urban centers where they are purchased by consumers and the larger essential oil market. With so many individuals involved, how is the potent and correct medicinal plant assured through the supply chain? I will follow *Lavandula* spp. and *Thymus* spp. at each step of the commodity chain and explore the criteria used by collectors in the High Atlas villages, as well as middlemen, wholesalers and vendors in Marrakech, to establish plant identity, quality and purity. Participant observations and semi-structured interviews will be employed to elicit salient botanical identification characteristics used within the supply chain and these will be compared laterally. Quantitative ethnographic results from interviews will be compared to qualitative chemical markers assessed through gas chromatography. Similarities and/or differences between the organoleptic and phytochemical ways of assessment will be examined with special attention paid to any differences noted in identification, quality and purity throughout the different stages of the supply chain. This field work and analytical comparison seeks to enrich modern analytic analysis with ethnographic evidence, thus supporting the idea that traditional and manual ways of identifying and evaluating medicinal plants is a refined skill and a useful means of assessment.

The Role Of Plants In The Colombian Folklore Seen Through Its Handicraft Production. Preliminary Observations

Carolina Romero Hernández

Institution: William L. Brown Center, Missouri Botanical Garden

In Colombia the plants used in the elaboration of handicrafts play an important role in the economy of both rural communities and artisan groups in urban areas. The use of materials of plant origin in the manufacturing of handicrafts goes back to the pre-Columbian era. Handicrafts as a material expression of cultural heritage represent the popular expression of a culture, its relationship with the environment and at the same time its interaction with other cultures. There are few works that list the plant species used to make handicrafts in Colombia that at the same time detail their use and context in popular culture. In order to prepare a compendium of the plants used in Colombia for the elaboration of handicrafts and their cultural context, a preliminary review of the literature focused on the subject is being carried out as well as excursions to some craft centers and fairs in Colombia to: a) prepare a provisional list of scientific and common names of the plants used in the elaboration of handicrafts, b) establish different categories within the documented crafts, and c) identify the most representative areas in Colombia as craft-producing centers. So far 181 species have been recorded including Palms (17% of the total), Grasses (9%), and Legumes (4%). Thirty-one categories of craftsmanship were identified that involve the use of material of plant origin the most representative being: Basketry, Carving, Hatmaking, Pasto Varnish, and Weaving. Artisan production centers are being identified within the 5 natural regions of the country. These preliminary data represent a continuous effort with the aim to prepare a compendium of the plants used in Colombia for artisanal production. Safeguarding this traditional knowledge in written form contributes to prevent the disappearance of Colombia's cultural heritage so intimately linked to its identity as a nation.

Appalachian Forest Medicinal Plant Harvests: Measuring The Size And Distribution Of Regional Harvests And Establishing Methods Of Local Population Assessments And “Responsible Harvesting” For Forest Farmers

Ryan Huish, Steven Kruger

Institution: University of Virginia's College at Wise

Few American non-timber forest products (NTFPs) are systematically tracked, meaning that the size and distribution of harvests, value of products and trends in production over time are often unknown. This increases risks for potential growers, harvesters and buyers, and is a barrier to effectively managing wild populations. RootReport (www.rootreport.frec.vt.edu) was created as a Virginia Tech extension program to measure output for medicinal plants other than ginseng being harvested in deciduous forests in the eastern United States. A survey was developed and sent to primary buyers of medicinal plants in 15 states, many of whom were also interviewed.

The project was designed so that data was organized in a format usable for multiple stakeholders, including participants. An online platform hosts results from previous years, and connects users with other resources, such as materials about growing and stewarding medicinal plants, and other institutions and organizations that support NTFP production. The presentation will show results compiled from three years of data collection and discuss the future of the project. Initial methods were created in the form of a manual for a general audience to be able to assess local populations of medicinal plants and how to monitor harvesting regimes by forest farmers.

Traditional Uses Of *Elytropappus Rhinocerotis* (Asteraceae) Against Foot Odour And Other Skin Diseases

Isabel Margaret Hulley, Sandy Van Vuuren, Nicholas Sadgrove, B-E Van Wyk

Institution: University of Johannesburg, South Africa

Elytropappus rhinocerotis (L.f.) Less. (Asteraceae) is a very popular and widely used fragrant plant in the Cape region also known as *renosterbos*. The dried stumps are a favourite firewood to prepare food and drink because of the distinctive flavour it contributes on an open fire. Medicinal ailments that can be treated with this aromatic shrub includes a variety of stomach related illnesses, for instance indigestion and diarrhea, respiratory ailments (including asthma and influenza), as well as back pain and leg cramps. Surprisingly, none of the earlier literature recorded the common widespread use of this species to treat foot odour and foot perspiration. Essential oils were hydrodistilled and analysed for this species for the first time. The major essential oil compounds were two monoterpenes (1,8-cineole and terpinen-4-ol) and four sesquiterpenes namely germacrene A, (-)-spathulenol, viridiflorol and silphiperfol-6-en-5-one. Isolation of two major labdane diterpenes, (+)-13-epilabdanolic acid and ent-labd-13-en-8 β -hydroxy-15-oic acid, was performed using silica and ethyl acetate in hexane (3:7 v/v) as the mobile phase. The minimum inhibitory concentration (MIC) were determined for the essential oils, the two isolated diterpenes and the crude aqueous and phenolic extracts against five bacteria and one fungus associated with the skin and foot odour. The crude extracts and essential oils showed moderate to noteworthy activity against the selected test organisms, supporting the traditional topical use of *Elytropappus rhinocerotis* twigs against foot odour and other skin conditions. The activity of the crude extracts was several times more active against the *Brevibacteria* (0.0031 mg/mL against *Brevibacterium agri*) than the positive control (zinc oxide, at 0.33 mg/mL).

Nepalese And Native American Traditional Herbal Medicines Used To Treat Parkinson's Disease: An Exploration Of Their Untapped Potential To Restore Neuronal Health

Aurelie de Rus Jacquet, Jean-Christophe Rochet, Erin O'Shea

Institution: HHMI/JANELIA FARM

Recent advances in pharmacology and disease modeling have opened unprecedented avenues for the exploration of bioactive botanical extracts. In this context, the study of Nepalese and Native American traditional medicines revealed medicinal plants with remarkable neuroprotective activities in Parkinson's disease models. Extracts prepared from berries, garlic, elderflower and other plants protected neurons from degeneration. The generation of neurons and astrocytes from patient-derived induced pluripotent stem cells (iPSCs) allows for the first time to test the pro-health activities of botanical extracts on cells that closely resemble patient cells. These patient-like cells, or "disease in a dish", hold the promises for more translational results and a better understanding of the complex interactions between cells types in Parkinson's disease. Furthermore by combining iPSC-derived cells and advances in sequencing technologies, we are entering an exciting era of high-throughput transcriptome screening that will reveal new biological effects of traditional medicines and shed light on their untapped potential.

Ramping Up The Harvest: Phytochemical Variation In *Allium tricoccum* Across The Growing Season In Pennsylvania

Teal Jordan, Eric Burkhart, Margot Kaye, Joshua Lambert

Institution: Pennsylvania State University

Ramps/Wild leeks (*Allium tricoccum*) are a wild perennial species of the onion family, native to the deciduous forests of eastern North America. Ramps are known throughout Appalachia for their unique onion and garlic flavor and have expanded in popularity in recent years. While a rising number of producers wish to manage ramps as an agroforestry crop, knowledge of their nutritional and medicinal composition remains limited. Our research focuses on quantifying phytochemicals in ramps that are important drivers of perceived quality and putative human health benefits as they vary in relation to plant development and seasonality. For this study, we harvested ramps in April to November 2018 from established populations throughout Pennsylvania at key developmental

stages from spring emergence through the maturation of leaves, flowers, fruits, and into seasonal dormancy. Using new and previously developed laboratory methods, we are quantifying allicin, the organosulfur compound responsible for the scent and major health-promoting properties of garlic (*Allium sativum*), the total phenolic compounds, and the total anthocyanin content in the collected ramps. Comparisons are being made between developmental stages and reproductive status, between harvest locations, and between parts of the same plant (i.e. bulb, leaves, inflorescence, etc.). Our results are intended to support the development of scientifically based, sustainable ramp harvesting and consumption, including leaf-only harvests, by establishing baseline information around crop quality and phytochemistry in relation to plant part and developmental stage.

Pine Forest Development And Salt Production In Wakasa Town, Central Japan

Junko Kitagawa, Koji Seto, Hideaki Kojima, Yoshitsugu Shinozuka, Sena Irisawa, Kazuyoshi Yamada, Takehito Yoshida

Institution: Fukui Prefectural Varve Museum

Large area of Five Lakes of Mikata region, Central Japan were covered with pine forests until 1980's. Salt production has started in the area in the 4th century AD. Large amount of fuel was necessary to produce salt since it is extracted from sea water in Japan. Historical records indicate that siokiyama (forests developed for fuel to produce salt) had been distributed in the area before the development of a modern salt production method. The main tree species of the forests was probably pine. This study tries to clarify when pine forests started to develop around the region, in which area the forests developed and if salt production from the 4th century was related to the pine forest expansion in the region. Sediment cores were recovered from Lake Mikata, Lake Suigetsu, Lake Kugushi and Lake Hiruga and pollen analysis was conducted. Lake Hiruga and Lake Kugushi are closer to the sea coast and Lake Mikata is inland area. The main components of pollen were *Cryptomeria* and *Quercus* before the 10th century. The earliest severe deforestation was observed in Lake Mikata area in the 10th century when large areas of paddies were developed. Tree pollen concentration decreased quickly, and Gramineae pollen increased. However, the development of pine pollen did not increase until the 13th century. Pine pollen increased around Lake Mikata in the 13th century, but it did not increase in other lakes although other lakes are close to the salt production area. It can be concluded that pine forests expansion started inland area from the 13th century and it was not related to the ancient salt production started from the 4th century. It may be said that salt production became intensive and fuel production area was segregated from salt production area from the 13th century.

Ecological And Social Impacts Of Widespread Ash Tree Mortality

Wendy Klooster, John Cardina

Institution: Ohio State University

As forests worldwide are faced with devastating pests and pathogens, the resulting widespread tree mortality has cascading impacts on both the ecological and social communities of which they are a part. One such pest causing devastation throughout North America is emerald ash borer (EAB; *Agrilus planipennis*). Whereas the ecological impacts of ash (*Fraxinus* spp.) mortality have been well-studied, the social repercussions following their loss are less widely recognized. The presence of trees, in general, are known to positively impact mental and emotional well-being, so much so that in this case heroic efforts have been made to preserve prized ash trees against the threat of EAB infestation. And based on their popularity as a street tree in urban areas, even human populations who have little interaction with nature, in the larger context of the term, have been affected by EAB-induced ash mortality. Beyond the value of living ash trees, products made from ash logs have traditionally held great cultural relevance, such as the use of black ash (*F. nigra*) in basket weaving practices of indigenous cultures and the popularity of white ash (*F. americana*) as baseball bats and tool handles. The story of ash mortality involves fluctuating hopes and fears surrounding the discovery, attempted eradication, and continued spread of EAB; the latest chapter tells the tale of general acceptance regarding the fate of North American ash shifting into renewed panic as EAB has exhibited the ability to adapt to new hosts, including commercial olives. The ending is yet unclear, but continued awareness and understanding may help move us towards a positive conclusion.

Personal Values And Knowledge Of Locally Important Plants And Places In Belize

Jill Korach

Institution: Miami University

Few doubt individual personal values drive daily decisions on natural resource use. Last century estimates show

20% of global human populations reside in biodiversity hotspots (Cincotta et al; 2000). Local values are especially relevant where local agency is high like community-managed or private lands. Not typically delineated on maps, these important areas can be critical to livelihoods, species, and collectively, as a major component of global diversity. Most consider themselves connected to a specific place (Gifford 2014) and local knowledge of important areas can include further understanding of the species within. Previous research demonstrates that connections to place, or place attachment (Altman & Low 1992), can influence personal decisions and drive actions that benefit natural areas (Gosling & Williams 2010; Scannell & Gifford 2010). In this research, we partnered with Community Baboon Sanctuary (CBS), a community conservation initiative in central Belize focused on maintaining black howler monkey populations while promoting sustainable tourism. We interviewed 35 CBS community members on personally important plants and places, including rating important places on several key personal values (e.g., happiness, dependence) and assessing levels of place attachment. Each interviewee was also asked about specific benefits of valued plant species. We looked for trends among personal values, place attachment scores, and plant knowledge expecting most would value places for utility and plants for food, medicine, or construction. Results show home sites are important and 52 plant species were valued for additional reasons including plants that benefits the sanctuary's monkey species. A positive correlation was found between community members' plant knowledge and increased personal place attachment along with statistical relationships among several personal values. Join this discussion on how understanding attachment to natural places and knowledge of species can lead to improved conservation efforts and may offer conservation managers additional tools to engage and learn from local communities.

Indigenous Knowledge Of Medicinal Plants Used By Ethnic Communities Of South India

Santhosh Kumar J U, Krishna Chaitanya M J, Krishna V

Institution: Kuvempu University

The information of therapeutic medicinal plants used by ethnic/indigenous communities in the south of India is constrained at best. These ethnomedicinal treatments constitute a critical local healthcare resource and potential for expanding research on phytomedicines of India. The present study aims to document and evaluate the traditional knowledge of medicinal plants as well as compare the distribution of knowledge and examine where research efforts are concentrated in order to gain a glimpse of current needs and future possibilities for research in the region. This study conducted a literature review of multitude of ethnic/indigenous communities in regard to ethnobotany, medicinal plants, ethnic studies, and studies on traditional knowledge and included peer-reviewed journal articles, and scientific reports published between 1980 and 2016. Our study found a total of 2006 plant species belonging to 1034 genera and 215 families used in herbal preparations. Interestingly, only seven families contributed to the highest number of medicinal species and herbs used extensively for herbal preparations which include decoctions, infusions, tonics, and juice. This multi-disciplinary, wide-scale study brought in data from a wide diversity of both plant species and ethnic communities. The study documents the rich wealth of indigenous knowledge and usage of medicinal plants for the treatment of various diseases and also these research highpoints the potential of continued research with these communities and highlights some areas where more research efforts could be directed. This also underlines the potential for future studies on drug screening and the need for conservation of biodiversity and traditional ecological knowledge practices.

Indigenous People And Forest Management Practices In The Kailash Sacred Landscape And It's Surrounding Areas Of Far West Nepal

Ripu Kunwar, Maria Fadiman, Rainer W Bussmann, Bhagawat Rimal, Durga Kutal

Institution: Ethnobotanical Society of Nepal

Diverse types of indigenous forest management practices were found in Nepal according to culture, location, climatic condition and socio-economic situation. We studied indigenous forest management practices in the Kailash Sacred Landscape and it's surrounding areas of far west Nepal. A total of four fieldworks each lasts 15-25 days were made consecutively in 2015, 2016, 2017 and 2018 and visited Dadeldhura, Baitadi, Darchula and Bajhang districts of far west Nepal. Raute from Dadeldhura, Byashi from Darchula and Bajhang and sedentary farmers from Baitadi were interviewed. During late 1970s, the government of Nepal forcibly resettled a group of Raute from northern Darchula to Dadeldhura district, deteriorated the integrity between forest and indigenous people. Forest degradation escalated with enactment of Forest Nationalization Act 1957, resulted in a short supply of fuel-wood, fodder and wood. The forest exploitation was severe because the government forests of the districts were considered open commodity and harvesting medicinal plants was free or nominal fee based.

However, there were some indigenous forest management practices in place in Byash, Huti and Pipalchauri (Darchula) and Kotgaun, Salena and Binashaun (Baitadi) to stop degradation. The Raute fulfill their necessities by collecting forest products and bartering their wooden pottery for food-grains with the villagers. Due to changes in climate, land-use and socio-culture behaviors, forest degradation is expected to accelerate, urging more participatory forest conservation measures.

Preliminary Investigations Into The Logan Site (40DV8) In Nashville, TN

Madeline Laderoute

Institution: Middle Tennessee State

The Logan Site (40DV8) in Nashville, TN dates to the late Mississippian Period, and has been regularly disturbed by development and looting since the city's founding. Recently, the last major undisturbed portion of the site was purchased and destroyed to make way for future building projects. Prior to the destruction in January of 2017, a team of archaeologists from the Tennessee Division of Archaeology was able to go in and extract soil samples from every non-mortuary feature that remained at the site. These samples were then floated at the TDOA and are currently being analyzed by several archaeology students at Middle Tennessee State University. This poster will discuss the contents of the flotation samples from the first several features examined by the students. It will also attempt to provide some context to a portion of the Logan Site that no longer exists, and where salvage excavation represents the only systematic investigations ever completed.

Geochemical And Molecular Genetic Data From Reservoir Sediments Of The Ancient Maya City Of Tikal: Sustainability And Collapse

David Lentz, Trinity Hamilton, Anne Vonderheide, James Brunemann, Nicholas Dunning, Vernon Scarborough

Institution: University of Cincinnati

The city of Tikal in northern Guatemala, once a leading polity of the ancient Maya world, has drawn the attention of scholarly investigation for over a century. How the occupants of Tikal managed their precious water supply in the face of regular seasonal droughts without access to any permanent body of water and how they provided adequate supplies of food and forest products to expanding populations during an occupation that lasted over 1500 years have been questions of ongoing debate. The sudden abandonment of the city in the mid-9th century CE, especially, has long been a topic of enthusiastic discussion among scholars. Although the data generated by the current study have built upon the settlement pattern research of many previous scholars, the multi-disciplinary research approaches outlined herein are unique in that they focus on the integration of the ancient Maya of Tikal with their Neotropical environment in an effort to resolve the lingering questions regarding ancient Maya land use. In this study we have gathered geochemical and molecular genetic data from reservoir sediments that provide fresh insights into the management of the hydraulic system and the surrounding catchment basins. These systems combined to provide the water for household use and agricultural purposes that helped sustain the city through the dry seasons during the Late Classic period (600-850 CE). As the city moved into the subsequent Terminal Classic period (850-900 CE), however, a series of multi-decadal droughts ensued and the reservoirs became badly polluted, severely compromising the ability of the polity to maintain its population. The pollution problems and poor water quality likely contributed to the ultimate abandonment and demise of the once glorious and preeminent city.

Traditional Food Preservation Techniques Employed In The Sierra Tarahumara, Mexico

Edelmira Linares, Robert Bye

Institution: Universidad Nacional Autónoma de México

The Rarámuri (Tarahumara) of the Sierra Tarahumara (in the northern Sierra Madre Occidental of Mexico) maintain traditional food preservation due, in part, to the limited accessibility to industrially processed food products in this remote region. Because of the extreme climatic conditions of the region, the growing season lasts between 3 to 4 months. In order to survive over winter to the next agricultural cycle, they process the immature and mature products from their milpas (fields) such as: maize, beans, squash and quelites. "Chacales" are derived from blanched and dried corn on the cob while "pinole" is finely ground flour of popped mature maize kernels. In the case of squash, "flor pasada" is made from dried male flowers, "bichikori" is dried strips of peeled fruit and "pepitas" are dried seeds. In the case of edible greens, "quelites pasados" are specially processed so as to dehydrate them in order to preserve their culinary properties. Recently we have collaborated with the Rarámuri

to produce videos (in Spanish and Rarámuri) to document these techniques visually and in their own voices. These videos are available on YouTube: 1) El pinole y el esquiate en la sierra tarahumara, 2) La calabaza y su aprovechamiento en la Sierra Tarahumara, 3) Los chacales, anticipando la escasez de maíz en la Sierra Tarahumara, 4) Los quelites en la Sierra Tarahumara.

A Quantitative Survey Of *Vhavenda* Food Plants

Khathutshelo Magwede, B-E Van Wyk
Institution: University of Johannesburg

Data on food plants and their uses were gathered through a survey conducted amongst *Tshivenda*-speaking communities in the Vhembe District, Limpopo Province, South Africa. A flip-file with 179 composite photo plates of food plant species was used as a research tool. At the end of the survey, a total of 288 species used as sources of food were recorded, mostly for vegetables, edible fruits, seeds, tubers and gums. Tree species featured prominently as sources of leaves used as cooked vegetables. Families with highest number of edible species were the Fabaceae (14), Malvaceae (14), Cucurbitaceae (11), Amaranthus (9), Rubiaceae (9), Apocynaceae (8) and Anacardiaceae (6). The most frequently mentioned and used plants include species of the genera *Grewia*, *Amaranthus*, *Ficus*, *Momordica*, *Syzygium*, *Cucumis* and *Solanum*. *Adansonia digitata*, *Sclerocarya birrea*, *Momordica foetida*, *Bidens pilosa*, *Amaranthus hybridus*, *Obetia tenax* and *Syzygium cordatum* are particularly popular and important. Plant species with the highest diversity of uses were *Annona senegalensis*, *Sclerocarya birrea* and *Landolphia kirkii*. This quantitative data will allow future comparisons of *Vhavenda* food plant uses, recording changing patterns over time, as well as comparisons with other cultural groups.

Bioassay-Guided Chemical Fractionations Of A Tongan Medicinal Plant, *Syzygium corynocarpum* (Hehea), And Its Integration Into Tongan Public Health

Valarie Martucci, Ryan Huish, Floyd Beckford, Robin Woodard, Gajendra Shrestha
Institution: University of Virginia's College at Wise

Previous research has confirmed antimicrobial properties of Hehea (*Syzygium corynocarpum* (A.Gray) Mull. Stuttg. (Myrtaceae), a Tongan medicinal plant traditionally used to treat infections. Polar extracts of the leaves of this plant have shown antimicrobial activity against *Staphylococcus aureus* and have also shown activity against Methicillin-resistant *Staphylococcus aureus* (MRSA), with low cytotoxicity in mammalian cells. In the current research this antimicrobial activity has been confirmed using organic extractions and bioassays against *Staphylococcus aureus*. Both mature and young leaves were tested and results suggest that young leaves have the highest antimicrobial activity. These results confirm the traditional use of specifically using only the young leaves in their medicinal preparations, and also support the ethnobotanical approach to natural products research. Using column chromatography, the extractions of Hehea were separated based on their polarity, some of which showed no bacterial inhibition and others showed very high antimicrobial activity. The compounds separated with the highest antimicrobial activity were determined to have an average polarity based on the polarity index. Ultraviolet-visible spectrophotometry was used to separate the active average polarity compounds that are found in the young leaves. Chemical analysis will continue to determine further antimicrobial properties of the Hehea young leaves, including identification of the compounds that are inhibiting microbial growth as shown in the lab, and investigating hypotheses of the mechanism of action. Further research on hehea is needed to isolate and identify the active antimicrobial compound(s). There is also a pressing request to work alongside public health officials in Tonga to help alleviate the rising cases of MRSA infections within their country, while addressing broader concerns such as the sustainable harvest of hehea.

Everything Is Touga: Adaptive Strategies To Changing Fodder Accessibility In Two Moroccan High Atlas Mountain Indigenous Communities.

Elsbeth Mathau

Access and knowledge of fodder is essential in continuation of traditional livelihoods in many rural agricultural and pastoral communities. Indigenous Amazigh rural communities of the Moroccan High Atlas Mountains rely on a combination of wild and cultivated fodder for their animals. As agricultural development has expanded, compounded with climatic changes, fodder accessibility has changed significantly. These developmental and seasonal changes have altered livelihood focus and plant abundance, but reliance on animals and their cultural importance have maintained. This research compared fodder diversity and accessibility in two village

communities in the rural communes of Imegdale and Ait M'hamed. Using a combination of ethnobotanical and ecological techniques, the landscape, individuals, and households were surveyed to investigate what fodder species people fed livestock and how accessibility has changed over time. 112 fodder species were identified by respondents through botanical surveys, free-lists, interviews, and participant observation, all falling within four major folk categories based on where the plants were sourced. The importance and access to these groups of fodder species over time were assessed in each community through household surveys and ranking activities. This research provides insight on adaptive strategies of rural communities in the High Atlas for maintaining animal agriculture in response to social and ecological changes from modernization, agricultural development, and climactic shifts. And connects these adaptations to broader social, political and gender aspects of Amazigh society. By looking through the lens of fodder plants in two High Atlas communities, this research found the fodder encompasses a diverse variety of plants in these communities. Cultivation, sourcing, and conservation are foundational daily biocultural practices creating direct connections between humans and the landscape, and that women play a pivotal role in fodder interaction and carrying on traditional plant knowledge and foodways.

The Emotion Of The Forest: Contrasting Perspectives From Carpathian Mountains (SW Ukraine) And Apennine Mountains (Central Italy)

Giulia Mattalia, Nataliya Stryamets, Andrea Pieroni, Renata Soukand

Institution: University Ca' Foscari of Venice

In many mountain areas of Europe, lives of local dwellers and forests have been deeply interweaved for centuries. However, in many regions, economic and social shifts caused a sudden abandonment of these forestry activities. We compare two of such regions: Hutsulshchyna (SW Ukraine) and Casentino (Central Italy). The shifts that happened the XX century led to a strong depopulation of both the studied rural areas. We analysed current perceptions and legacy toward the forest of both Ukrainian and Italian local communities. Specifically, we studied the current and past uses of wild plant and mushroom taxa gathered in the forest to analyse the perception of the ecological consequences of such economic and ecologic shifts. Between 2017 and 2018, we gathered respectively 30 and 45 interviews in Casentino and Hutsulshchyna. The semi-structured interviews pointed out different aptitudes. The Ukrainian communities recognized the unicity of their local ecological practices regarding forest management and highlighted their emotional tie and deep identification between themselves and the forest that provided economically valuable products such as *Vaccinium myrtillus* and *Boletus edulis*. This occurs despite abrupt socio-ecological changes including abandonment of pastoral activity and deforestation. Conversely, inhabitants of the Casentino forests, showed relevant emotional distance to the forest, mainly due to the bureaucracy caused by the institution of a national park in 1993 and the full abandonment of traditional forest-related activities. These factors contributed to creating a deep gap between forest and local communities that feel overwhelmed by conservation measures and complain the overgrowing of the forest and the disappearance of undergrowth berries such as *Rubus ideaus* and *Fragaria vesca*. We discuss that these different aptitudes are crucial to develop local strategies for achieving overall ecological, economic and social sustainability to preserve the local ecosystems. This project has received funding from ERC, grant agreement No 714874 and PRIN 2015P8524C.

Ethnobotanical Survey Of Useful Plants In Ixopo Area, Kwazulu-Natal, South Africa

Sibonelo Glenton Mbanjwa, B-E Van Wyk

Institution: University of Johannesburg

The documentation of useful indigenous plants and associated cultural information has become increasingly urgent, as there are accelerated losses of both natural habitat due to various land use activities, and losses of indigenous knowledge due to life-style changes and the adoption of Western practices. The aim of the study was to record and analyze the patterns of indigenous plant use in three rural villages in the Ixopo area (Ubuhlebezwe Local Municipality) of KwaZulu-Natal, South Africa. We used a flip-file with photo plates of a selection of 143 ethnobotanically relevant plant species to interview 37 participants (villagers) of Endwebu, Hlokozi and Enkwazi and to record all vernacular names and local uses. The matrix method was used to analyze the data, resulting in an average Species Popularity Index (SPI) value of 0.63, with no significant differences between villages (0.65 for Endwebu, 0.59 for Hlokozi and 0.64 for Enkwazi). This indicates that useful plant species are still relatively well known in the study area. More or less the same species were found to be popular in all three villages. The average Ethnobotanical Knowledge Index (EKI) value was 0.63, and there were no significant difference between the villages (0.65 for Endwebu, 0.59 for Hlokozi and 0.64 for Enkwazi). This study further recorded a range of

other plant species used in Ixopo, and their uses include food, medicinal, craft, veterinary, magical and spiritual uses. The data collected are of cultural significance to the Zulu people and the people of Ixopo, since there is currently no published information on the useful plants from this area. The study will contribute to the preservation of local indigenous knowledge about the plants of the Ixopo area and will allow for future comparative studies of the temporal and spatial distribution of Zulu ethnobotanical knowledge.

Water Lily Symbolism In Central Mexico

Andrew Mcdonald

Institution: University of Texas, Rio Grande Valley

The role of waterlilies (*Nymphaea* spp.) in Maya iconography and ritual has been explored comprehensively and found to relate symbolically to various divine motifs, personages and universal principles of ancient Mesoamerica. The flower is closely associated with a feathered serpent, aquatic spirits, cosmic birds, sun-gods, various cosmogonic themes and calendric indicators. Few investigations have explored, however, closely related roles of this iconic plant among contemporary civilizations in Central Mexico. A systematic investigation of floral symbolism among urban centers of the Toltecs, Mixtecs and Aztecs reveals similar and parallel uses of water lily imagery throughout the Valley of Mexico, the Valley of Puebla, Morelos and points beyond. Analysis of iconographic practices among historical sites that were constructed under *both* Mayan and Central Mexican influences -- such as Teotihuacan, Xochicalco, Cacaxtla and Chichen Itza -- demonstrate that distant cultures were plainly aware of their shared, yet regionally distinctive conceptions of this sacred plant. These conclusions identify water lily symbolism as a new and hitherto unidentified, unifying feature of Mesoamerican culture and history.

Three Decades Of Ethnobotanical Research And Educational Initiatives In Micronesia

Mark Merlin

Institution: University of Hawaii at Manoa

The small, far flung islands of Micronesia are located in the northwestern tropical Pacific Ocean region. Within the last few thousand years, fishing and farming people with expert sailing skills discovered and colonized these high and low islands. Progressively, the indigenous societies transformed parts of the islands largely by introducing useful plant species and utilizing a growing cumulative knowledge concerning the native biota. Micronesians developed sustainable economies, chiefly based on their ethnobotanical traditions. However, modernizing cultural trends have induced changes in customary life styles, resulting in significant loss of traditional knowledge, especially among the younger generations. Contributing factors include encroaching globalism, introduced species, dietary changes and outmigration to the United States. In response to the region-wide loss of traditional ethnobotanical knowledge and human-induced environmental disturbance, many colleagues and I have worked to preserve Micronesian ethnobotanical and ecological knowledge, with special emphasis on developing educational materials for students, teachers and resource managers. This paper outlines the objectives, methods and results of a three-decade long survey of Micronesian ethnobotany and traditional ecological knowledge. Key products include publication of six textbooks (for Palau, Yap, Chuuk, Pohnpei, Kosrae and the Marshall Islands), along with an open access website focused on traditional ethnobotanical relationships among the Marshallese atoll dwellers. More recently, enlarged, newer editions of the six textbooks, first produced in the 1990s, are either completed, under production, or in negotiation with local ministries of education. Furthermore, a very extensive, comparative, region-wide ethnobotanical internet data portal is nearing completion, currently featuring 285 plant species within 218 genera that belong to 90 families,. Each plant species incorporated into this new open access website features botanical descriptions, ecological and geographical distributions, and comparative discussions of human utilization over time. Information for each species has been critically derived from a comprehensive review of published literature and personal communications.

Can Nature Inform Nurture? Exploring The Role Of Climate And Meteorology To Assess The Efficacy Of The Lanceleaf Stonecrop As Candidate Green Roof Vegetative Cover.

B.J. Merritt, S.F. Matter

Institution: University of Cincinnati

Green roofs provide a potential opportunity to enhance ecosystem services in urban and suburban environments. The increase in numbers of green roofs and incentives for them is obvious when considering the benefits they

provide, including reduced heating and cooling costs, noise reduction, improved air quality, reduced stormwater runoff, and habitat for wildlife. Many studies in search of the best species to implement on green roofs test the efficacy of specific genera and species by placing them on green roofs and assessing survival and longevity; however, few studies take an opposing approach by looking at how species interact in their natural environment to assess value and target species for application according to relevant ecoregions and meteorological regimes. Here we explore the relative roles of climate and meteorology in explaining population dynamics of the lanceleaf stonecrop, *Sedum lanceolatum* Torr. (Crassulaceae). This species is infrequently used in green roofs; however, earlier work has suggested it may be an ideal vegetative cover on green roofs in the western United States. We used abundance records along 17 meadows from 2003 to 2018 of *S. lanceolatum* in the front ranges of the Rocky Mountains, along Jumpingpound Ridge in Alberta, Canada to characterize the roles of climate and meteorology in changes to population abundance. Identifying the relative roles of climate and meteorology in growth of this species will help to define relevant ecoregions and yearly meteorological conditions where *S. lanceolatum* will be most effective as vegetative cover on green roofs. Climate, measured using Pacific Decadal Oscillation (PDO), and local weather, measured as temperature and precipitation, were combined with local topographic parameters and biotic variables to identify statistical models that best describe population growth of *S. lanceolatum* along these meadows. We used randomForest, rpart, and statistical modeling to identify which of over 230 variables were most important to describing changes in population growth. These relevant predictors were combined in three separate models, including a climate-only, a weather-only, and a combination model to identify which suite of predictors were most valuable in describing population growth along these meadows. Developing a stronger understanding of the relative roles of climate and meteorology in natural changes to population growth in this species will help to assess whether its application on green roofs should be more narrowly focused according to local meteorology, or if it can be generalized according to broader climate trends.

Food From The Forest: Zulu Edible Plants Of Amandawe, Kwazulu-Natal, South Africa

Lloyd Mhlongo, Ben-Erik Van Wyk

Institution: University of Johannesburg

In this ethnobotanical study, we recorded 176 edible plants from 65 different families. Of these, 111 species and 57 food uses were new records for the Zulu culture. Fruits (106) and leaves (49) were the most popular plant parts used. The data included 467 *isiZulu* vernacular names for food plants, of which 321 appear to be unrecorded in the scientific or popular literature. Most of the edible plant species (161) occur naturally in forests (108), coastal thickets (28) and grasslands (28), with smaller numbers either cultivated or collected from disturbed environments. Natural habitats, and especially the forests, play a vital role as a source of foods that are eaten raw (161 species), as well as those that require cooking (40 species). Through rigorous interviews with 37 participants, and using a flip-file of photographic plates as visual cues, we recorded high quality comparative data for quantification and analysis. This included the ethnobotanical knowledge index (EKI) and species popularity index (SPI) as proposed for the Matrix Method, as well as the cultural importance index (CII). There was close agreement between the 24 food plants known by all the people (SPI-value of 1.00) and those identified as important using the cultural importance index. On average, the edible plants had an EKI-value of 0.49, which was considerably higher than the 0.27 previously recorded for medicinal plants. The information gathered may hold vital clues for solving future hunger problems by discovering and reviving new and existing alternative food plants and more especially potential plants for crop and product development. The large proportion of unrecorded traditional information collected at Amandawe shows that there are still huge gaps in our scientific knowledge of the vernacular names and uses of the indigenous plants of southern Africa.

Evolutionary, Biogeographic, And Cultural Insights Into The Current Distribution Of Piper Umbellatum

Lindsey Miller & Eric J. Tepe

Institution: Department of Biological Sciences, University of Cincinnati

Piper umbellatum, a relative of the black pepper, is found around the world in the tropics, and is widely used as a traditional medicine. *Piper umbellatum* presumably originates from the New World and, because of its many traditional uses, it is hypothesized that this species was likely traded around the tropics by humans. Paradoxically, *P. umbellatum* is most frequently found in open, disturbed habitats in its presumed native range, but where it is introduced, it is frequently found only along streambanks in shady forest habitats. To address these questions, we used a molecular phylogenetic framework based on nuclear ITS and chloroplast *petA-psbJ* sequences, comprising 24 *P. umbellatum* samples from 17 countries, including eight from the Americas, six from

Africa, and three from Asia. The phylogeny suggests that *P. umbellatum* is indeed New World in origin, with a single dispersal event to the Old World. Furthermore, the molecular clock analysis suggests that dispersal to the Old World may have occurred much earlier than expected, ranging from 0.1-10 years Mya. To further examine the possibility of human mediated dispersal, we examined patterns of traditional uses and local names for *P. umbellatum*. The most common uses were all therapeutic and were focused on women's reproductive health, gastrointestinal issues, and wound healing. Geographic trends in shared traditional uses could suggest recent spread of a species via trade and cultural exchange, but no trends are apparent in *P. umbellatum* in any part of its range. Similarity in local names, however, suggest likely cultural exchange of *P. umbellatum* among several Central African countries, and possibly with Southeast Asia. This review provides an updated comprehensive list of traditional uses and local names of *P. umbellatum* throughout its current range, and contributes to our understanding of the evolutionary, biogeographic, and cultural histories of this widespread species.

Karuk Agroecosystem Resilience And Cultural Foods And Fibers Revitalization Initiative: Xúus Nu'éethi – We Are Caring For It

Megan Mucioki, Dan Sarna, Jennifer Sowerwine, Lisa Hillman

Institution: University of California, Berkeley

The Klamath River Basin of Northern California and Southern Oregon historically supported diverse forest and riparian ecosystems that were stewarded by Native communities through land management and ceremonial practices. Presently, the cumulative impacts of mining, logging, fire suppression, agriculture, and road building over the past century have resulted in a dramatic degradation of terrestrial and aquatic habitat and a steady decline in quality, accessibility and availability of cultural foods and fibers that are vital to the health and well-being of Karuk people. Results from a household survey conducted by the Karuk-UC Berkeley team found high rates of poverty, food insecurity, dependence on food assistance, and severely limited access to and availability of cultural foods among Karuk households, albeit a strong demand to revitalize cultural food systems and landscapes. In this context, the Karuk-UC Berkeley collaborative team embarked on a three-year project to help improve the quality, access, and availability of cultural foods and fibers by developing and conducting an agroecosystems condition assessment of culturally important forested areas throughout the Karuk Aboriginal territory. This assessment integrates Indigenous Knowledge and western science frameworks to assess the condition of cultural resources under variable climatic conditions in Karuk gathering areas including historical data on plant distribution and cover to understand how these forest landscapes have changed. In addition, our project integrates a range of extension and education objectives, including expanding the Karuk Herbarium and building STEM skills of Karuk youth. Our approach and forthcoming results will serve as a model for other tribes and land management agencies working to restore cultural foodways and enhance human and forest ecosystem health.

Knowing Our Future Forests: Exploring The Institutional And Cultural Dynamics Of Uncertainty And Knowledge In Forest Planning

Daniel Murphy

Institution: University of Cincinnati

Current trajectories of climate change pose considerable risks to the future of forests around the world. However, climate change and human responses to it also foster a great deal of uncertainty. This paper describes efforts in US resource management agencies to confront the problem of uncertainty in forest planning and examines the underlying institutional and cultural dynamics of these agencies that affect how they respond. More specifically, drawing on interviews with planning professionals in various federal resource management agencies, this paper analyzes and considers the manifold ways in which different forms of knowledge are recognized and utilized by forest planning practitioners or otherwise come to bear on forest planning processes.

Etymology Of Folk Nomenclatures For *Sphenostysis stenocarpa* (Hoechst Ex A. Rich) Harms

Catherine Veronica Nnamani, Christopher J. Atkinson, Joel E. Nwite

Institution: Ebonyi State University Abakaliki, Nigeria

Folk nomenclature is habitually established for species that have attained high utilitarian and cultural significances by custodians of such plants worldwide. Such folk names assigned to species often carry etymological values such as therapeutic effects, morphological features, mythical connotations, and their allegorical values. This research sought to unveil the etymology in folk nomenclatures of *Sphenostysis stenocarpa* (Hosch ex A. Rich)

Harms (African Yam Bean). Three hundred and fifty respondents were randomly selected from 13 local communities in South-eastern, Nigeria. Data were collected through oral interviews with semi-structural questionnaires, along with focused group discussions. Analysis of data was carried out using simple statistical methods. Variables which were significant were then subjected to analysis of variance (ANOVA). The results recorded ten folk nomenclatures assigned to this species in seven dialects affiliated to cultural values within these communities. Etymologically, the result also revealed that out of the ten folk names of AYB cryptic connotations, five reflected their trust in their gods that answered their prayers, two were attributed to the healing potentials inherent in this crop for medicine, three names were associated with the seeds accruing from the plant, while one referred to feminist attachment to the crop, another reflects to its resilience/adaptability to climatic stress and one as a sustainer of farmers. Considering that folk nomenclature is based mainly on qualitative data and the information outside the scientific domain, they are nonetheless highly valued because they are based on long-term interactions, utilization and observations of the custodians of these natural resources. However, it is equally vulnerable to erosion if not properly documented and conserved for posterity.

Using Ethnobotany To Teach Global Literacy

Blair Orr

Institution: Michigan Tech University

Michigan Technological University requires all undergraduate students to take 12 core credits of general education and 12 focused general education credits. The focused classes must align with a specific university learning goal. Each learning goal has a rubric that describes the objectives of the learning goal and the broad measures used to assess how well the objectives have been achieved. Most focused courses are taught within humanities or social sciences. An ethnobotany course has been developed within the School of Forest Resources and Environmental Science that is designed to address the Global Literacy learning goal. This presentation focuses on the content of the ethnobotany class and the development of global literacy among third- and fourth-year undergraduate students. Learning objectives are incorporated in both the lecture syllabus and in the primary writing assignment for the course. The primary assignment is both graded by the instructor and assessed for achievement of the learning objectives by the University General Education Council.

Tropical Forests, Agroforestry Systems And Plant Resources: Conservation Challenges And Indigenous Perspectives From Amazonia And Nicaragua

Jim Penn

Institution: Grand Valley State University

Rapidly changing socioeconomic conditions in the tropics, including urbanization, are imposing new pressures on tropical forests, while indigenous adaptation strategies continue to exploit forest resources in ways that both hinder and promote forest conservation. This study highlights examples of Mayangna, Miskito, Quechua and ribereño perspectives on forest use and agroforestry practices from lowland and montane forests of Nicaragua and northwestern Amazonia. Changing patterns of forest and agroforest use are documented and compared, along with the changing subsistence and commercial importance and availability of forest resources in these areas. While several similarities exist among their traditional plant and forest use practices, differences are more common as these forest societies from different regions experience changing environmental and socioeconomic realities. For example, acute economic poverty for a growing rural population in Nicaragua has led to decreasing forest resources and increased deforestation while indigenous communities struggle to earn a living from different forest environments. In Peru, rural to urban migration and a shortage of labor has led to less adoption of highly productive indigenous agroforestry systems, even with an improving economy for forest resources extracted or cultivated by locals. In both countries, but for different reasons, these contrasting situations have resulted in increased charcoal-making in forested areas previously considered to be inferior environments for this activity, as well as a return to extractive activities of the past such as fiber and resin collection to supply new markets. Comparing findings from fieldwork in different forest environments of Central and South America provides new lessons to help us to better understand the complex mix of problems, challenges and opportunities that indigenous forest residents and their forested lands face in the 21st century.

Traditional Agronomic Practices In Disuse And Phytopathological Problems: The Case Of Xpm Dispersion In The Cassava Cultivation From The Colombian Caribbean

Darío Pérez, Sophie Caillon, Anne Duputié, Camilo López, Christian Vernière, Szurek Boris

Institution: IRD, CIRAD, Université Montpellier, IPME

Cassava is a primary crop for food security of thousands of people in the world. In Colombia, the Caribbean region contributes about half of the total production of cassava at the national level, despite the region's socioeconomic difficulties such as land property, climate change and phytosanitary problems. A major threat to this crop staple production is Cassava Bacterial Blight (CBB), which is a disease caused by the bacterial pathogen *Xanthomonas phaseoli* pv. *manihotis* (*Xpm*) able to cause irreversible damage to the plant and impeding growth and productivity. Cassava is mainly propagated by cuttings which are often distributed from nurseries or exchanged between farmers. Our objective was to analyze the impact of the social organization and agricultural practices on the exchanges of cassava material by farmers and their effects on CBB dynamics. In this study we documented the sociocultural practices impacting the distribution of *Xpm* in cassava crops in the Colombian Caribbean, taking as a case study the exchange network of cassava cuttings in a municipality that lives almost exclusively from its cultivation and marketing: the Villa-López Town, Sucre-Colombia. Semi-structured interviews were conducted with 63 farmers to inform individual sociodemographic characteristics, management practices of cassava crop, and perceptions about the incidence of *Xpm*. Data on the circulation of the cultivated cuttings was collected by questionnaires. In addition, cassava leaves were sampled *in situ* to diagnose the presence of *Xpm* in the laboratory. We found that the majority of peasants cultivate small areas of land that they need to rent, and that both the selection of the landraces that are planted and the crop management depend on the dynamics imposed by the market. *Xpm* could be isolated from about half of the fields visited. Our results show that the occurrence of this bacteria is closely linked to crop management practices and to the social dynamics of exchanges.

Contaminated Water And The Collapse Of An Ancient Maya City: Microbiome Analysis Of Reservoir Sediment From Tikal Reveals Deteriorating Water Quality

Cory Perfetta, David Lentz, Andrew Czaja, Eric Tep, Joshua Cooper

Institution: University of Cincinnati

The city of Tikal, in Northeastern Guatemala, was a Maya polity for many centuries until it became deserted within a 50 year span during the Terminal Classic period (850 – 900 CE). The abandonment may have been caused by numerous hardships but the cause remains unknown. We hypothesize that extreme drought, documented to have occurred during the occupation of this city, and the related contamination of freshwater reserves was the leading cause of the collapse. I present a chronological change of Tikal reservoir water quality from the Early Classic through Post Classic generated by diatom identification in radiocarbon dated layers of reservoir sediment cores. Within the Early Classic and Late Classic periods, *Lindavia radiosa* and *Lindavia bodanica* were the dominant species, indicating water quality was within today's EPA standards for safe drinking water. When we move into the Terminal Classic period, however, *Cyclotella meneghiniana* and *Cyclotella distinguenda* became the most numerous diatoms indicating the reservoir's water developed eutrophic characteristics. Additionally, phosphate analysis provides support for the decline in reservoir water quality seen in our diatom survey. This data indicates a possible change in the available drinking water across multiple reservoirs during the city's habitation. However, additional core sampling and increased diatom sample size will be required to truly uncover the role of water quality in the city's abandonment.

Cryobiotechnology For Preserving Exceptional Plants For The Future: A Case Study Of Endangered Hawaiian Species

Megan Philpott and Valerie Pence

Institution: Center for Conservation and Research of Endangered Wildlife (CREW), Cincinnati Zoo & Botanical Garden

Conservation strategies for plants have historically included seed banking in ex situ collections, which is a relatively affordable and accessible way to conserve a species. However, an increasing number of plants are being labeled as "exceptional species," or species for which traditional seed banking methods do not work. Exceptional species may produce recalcitrant seeds sensitive to drying or freezing, or they may produce no seeds at all, and they appear to be concentrated in the tropics, some of the most threatened landscapes in the world.

They include such economically and culturally important species as cacao, coffee, oaks, chestnuts, many palms, and dipterocarps. How do we ensure that these exceptional species persist in light of increasing threats to biodiversity? The Center for Conservation and Research of Endangered Wildlife (CREW) at the Cincinnati Zoo & Botanical Garden maintains a liquid nitrogen (LN) bank of seeds and tissues of endangered exceptional species for long-term conservation. Exceptional species preserved in CREW's CryoBioBank® include many species of oaks, bryophytes, ferns, and flowering plants. CREW is currently collaborating with the Lyon Arboretum in Hawai'i to develop cryopreservation protocols for the many endangered exceptional Hawaiian species maintained in their ex situ tissue culture collection. Cryopreservation protocols have been tested in seven Hawaiian species so far, with three species already banked at CREW. One of these species, alani (*Melicope mucronulata*), was used by early Hawaiians as clothing, medicine, and lei, but is currently known from a single population of only three plants on Moloka'i. Survival after experimental LN exposure has reached 60% in some samples banked at CREW. In order to preserve culturally significant and economically important species for both cultural use and scientific research, it is imperative that we look beyond seed banking to save exceptional species. Research supported in part by IMLS grant no. MG-30-17-0055-17.

Medicinal Plant Knowledge In Portland And Kingston, Jamaica: An Historic Comparison.

David Picking, Ina Vandebroek

Institution: The University of the West Indies

Ethnobotanical fieldwork was completed in the rural community of Windsor Forest, Portland and the urban community of Payneland, Kingston in 2014-2015. Adult participants were interviewed who had previously used medicinal plants, and records made of common plant names and medicinal use. Plant collections were completed and scientific names verified. Twenty photo interviews and 20 semi-structured interviews were completed in Windsor Forest and 41 photo interviews and 38 semi-structured interviews in Payneland. Data yielded 847 and 780 distinct plant use-reports in Windsor Forest and Payneland, respectively. Analysis of the data identified 42 plant species with medicinal uses that were confirmed independently by at least 20 percent of the survey participants. Arranging these reported uses into 22 medicinal use-categories a comparison was made with historic therapeutic indications for medicinal plant use reported in Jamaica since 1714, published by Asprey and Thornton in 1955. Species synonymies were resolved following the Kew Gardens Medicinal Plant Naming Service. The Windsor/Payneland data yielded an average 9 use-categories per plant (386/42) compared to 2.5 for the historic data (92/36), with ranges of 1 to 17 and 1 to 6 use-categories each, respectively. Within the historic data seven use-categories were absent in comparison to the Windsor/Payneland data, including cancer, diabetes and prostate problems. Also within the historic data, only two plant species, *Cissus verticillata* and *Gliricidia sepium*, identified higher numbers of use-categories compared to the Windsor/Payneland data. Of the 42 plant species reported in the recent fieldwork, six were not previously recorded by Asprey & Thornton, four exotic species, *Antigonon leptopus*, *Morinda citrifolia*, *Nopalea cochenillifera*, *Ocimum gratissimum*, and two native species, *Ruellia tuberosa* and *Senna alata*. This preliminary analysis of the data provides an interesting insight into the contemporary use of medicinal plants in an urban and a rural community in Jamaica.

Ethnobotany-Guided Identification Of Antibiotic Resistance Modifying Agents For Multidrug-Resistant Infections

Cassandra Quave, James Lyles, Huaqiao Tang, Micah Dettweiler, Monique Salazar

Institution: Emory University

An estimated 700,000 people currently die each year worldwide due to antimicrobial resistant infections, and this is projected to reach 10 million by 2050, outpacing the number of deaths due to cancer. While the development of new antibiotics based upon existing chemical scaffolds is one popular approach, it presents limitations due to the innate ability of bacteria to rapidly develop resistance to molecules that target essential growth pathways. Here, we describe our approach, which focuses on restoration of antibiotic activity with resistance modifying agents (RMAs). By taking a combination therapy approach, RMAs can be used to target resistance mechanisms, such as efflux pumps and antibiotic modifying enzymes to enhance or restore antibiotic activity. Plants are a potentially rich source of RMAs, but have not been widely investigated for this purpose. Given the unique composition of our ethnobotanically guided natural products library, we elected to screen it for compounds that act to potentiate antibiotic efficacy in otherwise resistant bacteria. We examined the QNPL, a one-of-a-kind natural products library created from medicinal plants (>600 species, >1,900 extracts) used in traditional medicine for the treatment of infectious disease, for potentiation of oxacillin (Ox) activity in MRSA isolates. This screen yielded a hit for

methanol extract No. 649. In several methicillin resistant *S. aureus* (MRSA) isolates, it reduced the MIC of Ox in a synergistic fashion (Σ FIC Index < 0.5) by up to 1,000-fold. Potentiation was dose dependent, and even at 4 $\mu\text{g}/\text{mL}$ of 649, the MIC for Ox dropped from 64 to 1 $\mu\text{g}/\text{mL}$, under the CLSI-defined breakpoint for susceptibility (≤ 2 $\mu\text{g}/\text{mL}$). The extract was partitioned with a modified Kupchan scheme and the ethyl acetate (649C) partition was most active. Chemical analysis by LC-FTMS revealed the presence of 42 compounds. Our current efforts are focused on identification of the bioactive compounds.

Forest And Indigenous Communities In Remote North-Western Border Districts Of Far West Nepal

Bhagawat Rimal, Ripu Kunwar, Chris LeBoa, Hari Sharma

Institution: College of Applied Sciences (CAS)-Nepal

Globally, 350 million people depend on forests for most of their subsistence and income, and about 1.2 billion people rely on agroforestry farming systems. Understanding the spatiotemporal pattern of forest cover change is now an essential part for balancing nature and livelihood in the remote areas of Nepal where the forest, indigenous communities and poverty are coexisted. This present study explored the forest cover and land use pattern and their interactions with poverty and indigenous communities in four remote and north-western border districts of Nepal. Landsat satellite images from 1989 to 2019 were used for the analysis of total 8786 km^2 area. We found that there was a gradual expansion of forested, settled and grassland areas, whereas the amount of cultivated land, barren land and water covered land decreased over time. Forests were found to be abundant in remote areas where the reach of the market economy and technological progress are inhibited. Indigenous communities such as *Byashi* and *Raute* inhabit the remote areas with high forest cover, but they also deal with high levels of poverty due to their lack of interaction with the larger market economy. We found that the increase of forest cover was a result of indigenous forest management practices, population emigration towards lowlands and urban centers and reduced consumption of firewood and fuelwood.

Placing Human Landscape Legacies In A Dynamic Systems Framework

Nanci Ross, M Henry H Stevens

Institution: Drake University

Ancient human-landscape interactions have left their imprint on plant communities around the world. These legacies pose exciting questions about the dynamics and stability of ecological communities where humans are part of, rather than apart from, ecosystems. As we continue to uncover these legacy effects, it will be useful to place them in a general framework to help us understand key features that various legacies share, and key features that are unique. We propose that human landscape legacies, including the myriad impacts of the ancient Maya on Mesoamerican forests, can be more fully understood within a dynamic systems framework. The strength of the dynamic systems approach is that it places all legacy effects, short and long term, with biological or physical causes, into a common theoretical framework. It provides us with a basis for organizing legacy effects into three types of dynamics, each differing in their underlying mechanisms in testable ways.

Inventory Of Medicinal Plants In Atan, Okansoso, Village, Badagry, Lagos State, Nigeria: Strategies For Biodiversity Conservation. &Am

Olubunmi Josephine Sharaibi, Tolulope Seun Ewekeye, Adeolu Adenuga

Institution: Lagos State University, Lagos, Nigeria

Due to increasing interests in the use of medicinal plants worldwide; there is the risk that a growing herbal market and its great commercial benefit might pose a threat to biodiversity through over harvesting of the medicinal plants. These practices, if not controlled, may lead to the extinction of endangered species and the irreversible destruction of natural habitats and resources. This study was designed to identify plant species used for medicinal purposes in Atan Okansoso village Badagry, Lagos State, Nigeria, examine their distributions and propose strategies for their conservation. Six plots were randomly selected in the study area and a transect line were evenly cut, using a 30 m^2 measuring tape a 10 m x 10 m line was then drawn. The medicinal plants found within each sample plot were then recorded. Descriptive statistics such as frequency, percentage distribution, frequency of distribution, relative frequency, frequency of occupation, density, relative density, abundance, relative abundance, Sorensen coefficient of community similarity index, were used to analyze data. In addition, graphs, tables, figures and images were used to interpret the findings. One hundred and ninety-three (193) medicinal plants belonging to fifty-two (52) families consisting of 103 species are found in the study area. Family

Asteraceae had the highest number of species (40) followed by the Leguminosae (14) while Sapindaceae, Rutaceae, Vitaceae had one (1) species each. The medicinal plants include *Asystasia gangetica* (Acanthaceae), *Ipomoea involucreata* (Convolvulaceae), *Calapogonium mucunoides* (Leguminosae), *Dioscorea dumetorum* (Dioscoreaceae). Others include *Sporobolus pgramidalis* (Poaceae), *Corchorus aestuans* (Tiliaceae), *Stachytmapheta cagennensis* (Verbenaceae) and *Aframomum melegueta* (Zingiberaceae). The strategies for biodiversity conservation proposed include controlled harvesting of the medicinal herbs, establishment of herbs garden, enforcement of government rules and regulations on poaching, reduced deforestation and increased afforestation practices.

Poisonous Delicacy: Ethnobotany Of Edible *Rhododendron* Flowers

Yinxian Shi, Min Zhou, Xuefei Yang

Institution: Kunming Institute of Botany, Chinese Academy of Sciences

Ethnobotany of wild food plants, is far more comprehensive than an investigation of edible plant species list, when considering that if one does not acquired knowledge about how to eat the plants properly, then the list may mean nothing. Wild edible flowers are exactly such a group of collections, whose edibility much depends on one's inherited knowledge. *Rhododendron* flower, one of the sources of "mad honey" with poisonous, is outstand as a key component in the flower-eating culture of Yunnan, China. Our research aims to 1) investigate which and where are the generally recognized *Rhododendron* species with edible flowers, 2) clarify how they are processed before they can be consumed and 3) evaluate the balance between benefits and risk during the procedure. Ethnobotanical survey was conducted in 14 county-level local markets, 86 stalls with *Rhododendron* flower were visited and totally 214 informants involved are interviewed. Our results show that the culture of eating *Rhododendron* flowers as a seasonal flavor is both as an old tradition and new cuisines in the area where the species natural distribute in Yunnan. In contrast with the historical record of high diversity of edible *Rhododendron* flowers, our local market investigation resulted only two *Rhododendron* species, *R. decorum* and *R. pachypodum*. The local people have a high degree of consistency in post-harvest process and prepare of each species, which indicate that *R. pachypodum* may potentially shares different toxicity with *R. decorum*. Our study provides a window to look inside how the indigenous people recognize and creatively use the poisonous plants as food, and expected to be a good case study to those who care about the safety issue of edible flowers, which may also act as an example to answer more general questions about the criteria of wild food plant selection and the rules for consumption.

Identification Of Archaeological Parenchyma Tissue

Venicia Martha Slotten, Katherine L Chiou, Christine Hastorf

Institution: Archaeological Research Facility, UC Berkeley

Underground storage organs were a key component of dietary consumption for prehispanic people in the Americas. However, identification of these plant parts in archaeological contexts is difficult and tends to mainly appear in studies that look at preserved starch grains. Underground storage organs also preserve as macrobotanical remains, but are often quite fragmentary. This experimental study looked at various roots and stems that were significant in ancient diets in Latin America in order to try to identify any diagnostic morphological features that may exist. Our experimental study imaged anatomical features from nine underground storage organs using a) stained thin sections of fresh specimen, and scanning electron micrographs of b) fresh samples and c) charred samples. The taxa analyzed include *Ipomoea batatas* (sweet potato), *Lepidium meyenii* (maca), *Manihot esculenta* (manioc), *Oxalis tuberosa* (oca), *Pachyrhizus erosus* (jicama), *Smallanthus sonchifolius* (yacon), *Solanum* (potato), *Tropaeolum tuberosum* (mashua), and *Ullucus tuberosus* (papalisa). The results of this study have successfully aided in the identification of archaeological parenchyma tissue recovered from sites in the Andes. This poster will demonstrate the diagnostic features that were identified among the samples and how they were used to identify archaeological specimens.

The Role Of Trading Botanical Items Within A Protohistoric Habitation Site, Wynema (33Ha837)

Michael Soellner

Institution: University of Cincinnati

Wynema (33Ha837), a protohistoric site situated in Southwest Ohio, was on the cusp of the European invasion. The site is located in Hamilton County in what is known as the lower Little Miami River Valley which can be

attributed to one of the Fort Ancient sites. The Fort Ancient site in Madisonville is now located in modern day Mariemont, within proximity of the Wynema site. This archaeological site allows us to take a glimpse into the past culture's reliance on plants in terms of its versatility which can be used in agriculture, diet, habitation, and other life necessities. The site is located in mixed mesophytic forest that could support Native American life but also a culture that thrived on traded goods. Evidence supports the trading of non-botanical goods during this time period circa 1350-1850 C.E but it was unknown if the people at the Wynema site actually traded botanical goods. I hypothesize that trading was a relevant practice to acquire: seeds for food, agricultural use, or other botanical necessities. The analysis and categorization of botanical remains from the protohistoric site was necessary to determine: 1) if in fact Native Americans were trading agricultural goods, and other plant materials, and 2) determine the provenance of botanical artifacts to establish a range. Using the ecofacts that were collected in previous years, starting in 2016, a systematic approach to reveal relevant data pertaining to the exchange of botanical goods was the essential layout of this research. Overall the findings concluded that the origins of the ecofacts at the Wynema site were all within a mixed mesophytic forest biome. This suggests that the Wynema people were focused on regional plants that may have been more successful and sustainable in this particular environment than plants acquired through trade.

Brown Award Address

David Spooner

I am extremely grateful to the Brown family for the honor of this award. I have had the great pleasure to work full-time as an endangered species field botanist, germplasm collector, and plant taxonomist for the last 40 years. During this time, I have given many talks about disagreements over species concepts, proper and constantly evolving analytical methods, and have presented many phylogenetic trees and interpreted these in the context of biogeography and interspecific classifications. While these have been fascinating, in this, likely my last scientific talk, I wish to be permitted to explore the engine that has propelled this work, namely a love of the outdoors, botanical literature, books by other botanists who also love their jobs, and pictures of plants gathered from colleagues. It has been a marvelous life to be given the gift of a love of plants, to make a living studying them, and to share this with colleagues who share this passion.

Community-Level Fruiting Phenology May Be More Stable In Garden Forests Of The Ancient Maya

Martin Henry Hoffman Stevens, Sydney M. Kreime, Nanci Ross

Institution: Miami University

Ecological legacies of the ancient Maya are myriad, and among these are the persistent remnants of former forest gardens. These garden forests are found in areas of once high density settlements, and they are characterized by relatively high abundances of once-culturally important woody species. We extended previous research in Belize and Guatemala to assess whether the potential fruiting phenologies of these forest communities differ from those of the surrounding forest matrix. We combined tree size census data from 63 20m x 20m plots with publicly available phenology data on 108 woody species to calculate aggregate community-level fruiting potential (CFP) in each month in each plot. Using Bayesian hierarchical models, we found strong evidence that CFP differed between garden forests vs. the surrounding forest matrix. Using all species, we found that CFP was higher in garden forest sites in January, September, and November (13%, 4%, 8%) but lower in May (-10%), due largely to the once-culturally important garden species and these differences were even greater when assessing only garden species. We also found that total CFP of garden species was greater and had 15% less month-to-month variability in garden forests than in the surrounding forest matrix. The greater and less variable fruiting potential of the garden species in these garden forests have implications for our understanding of Maya culture, for non-human plant-frugivore interactions, and for the mechanisms underlying the maintenance of the garden forest remnants over the past 1000 years.

Anthropogenic Forest Fires: Archaeological And Ethnographic Perspectives

Alan P. Sullivan

Institution: University of Cincinnati

Abstract: Twentieth-century ethnobotanical studies conducted in the American Southwest report that economically important pyrophytes, such chenopodium, amaranth, and tobacco were used extensively by indigenous populations. Inexplicably, however, these reports were seldom accompanied by accounts of production methods

for these fire-responsive plants, in vivid contrast to detailed ethnographic descriptions of maize cultivation. Contributing to this confusing situation is the fact that these ruderal species are the most common and ubiquitous taxa recovered from archaeobotanical and palynological contexts in upland Southwestern conifer forests, yet their significance is often disregarded (e.g., as “weeds”) in models of economic prehistory. This presentation focuses on resolving this “pyrophyte paradox” by presenting archaeological and contemporary fire-ecological evidence from conifer forests in the Grand Canyon area that indicates low-intensity understory burning was a common method of ruderal production – an economic activity that was not captured routinely by ethnobotanical researchers. Several possibilities are suggested to explain this situation, including the effects of changing prehistoric settlement patterns on forest-resource use (e.g., concentrations of populations in sparsely forested areas), the establishment of reservations in unforested areas, the prohibition of landscape burning on reservations, and the effects of grazing and fire suppression on understory plant community diversity. I conclude with some empirically-based observations that propose current forest conditions are a poor, if not misleading, analog for modeling past human-environment interactions, that the content of the archaeobotanical record should be considered a reliable proxy for inferring the nature of anthropogenic fire regimes that are older than 500 years, and that anthropogenic pyrophyte seed beds are more prevalent than modern vegetation surveys suggest.

Anatomical Identification Of Traditional South African Medicinal Plant Products

PM Tilney, B-E Van Wyk

Institution: University of Johannesburg

Anatomical studies provide valuable additional information to complement chemical analyses typically used for quality control. Such studies may be of forensic value to establish the sources of plants collected for medicinal purposes. Combinations of anatomical features, which can be of diagnostic use, are presented for nine examples of commercialised traditional medicines (*Agathosma betulina*, *Aloe ferox*, *Aspalathus linearis*, *Cyclopia genistoides*, *Harpagophytum procumbens*, *Sceletium tortuosum*, *Lessertia frutescens*, *Warburgia salutaris* and *Xysmalobium undulatum*). Some of the diagnostic features include prominent oil glands and mucilage cells (*Agathosma betulina*), aloin cells (*Aloe ferox*), tanniniferous epidermal cells (*Aspalathus linearis*), tanniniferous cells (*Cyclopia genistoides*), phellem cells devoid of visible contents (*Harpagophytum procumbens*), xylem cells in radial files (*Sceletium tortuosum*), epidermal glands (*Lessertia frutescens*), large secretory ducts (*Warburgia salutaris*), and isodiametric cortical cells (*Xysmalobium undulatum*). Anatomical studies provide a better understanding of the structure of the plant part that is used and thus contribute basic information for pharmacognosy applications. Anatomy is therefore a useful tool in assisting to identify plant products that are partly or fully commercialised.

Traditional Vietnamese Herbal Medicine: Anti-Diabetic Medicinal Plants Of Southern Vietnam

Lan Truong

Institution: CUNY Graduate Center, New York Botanical Garden

Type-2 diabetes (T2D) is one of the most harmful metabolic diseases around the world. This study evaluates the potential of medicinal plants from traditional Vietnamese medicine (TVM) for treating T2D, using informant interviews, participation observation, and in-vitro α -glucosidase inhibition assays. This project is the only of its kind that investigates anti-diabetic, TVM remedies, inclusive of spirituality, from an ethnobotanical context in Southern Vietnam. Buddhism has an integral role in TVM, evident from prolific herbal healthcare clinics within Buddhist monasteries throughout the Kien Giang province. Interviews with 34 healers found high local community use of TVM due to strong cultural and spiritual beliefs, affordability (no cost) and convenience. Vietnam also has high flora diversity, exceeding 10,000 species that have yet to be documented scientifically. This diversity includes many TVM species used for T2D. Informant interviews found the majority of species to be pantropical, introduced or naturalized, which indicates ethnobotanical knowledge transfer outside of Vietnam. Preliminary results from α -glucosidase screening of extracts from the 58 species collected showed significant enzymatic inhibitory activity of at least 50 percent (at 100 μ g/ml) for over half of the species. Twenty species (35%) exhibited inhibition activity exceeding 50 percent, with inhibition curves to be further calculated using IC₅₀ to determine specific inhibition at 5, 25, 50, 75 and 100 percentages respectively. These results suggest a targeted approach by traditional Vietnamese healers in selecting plant species with anti-diabetic activity.

Preventing The Next “Chestnut Blight”: A Call To Arms And Community Collaboration To Prevent And Monitor Plant Pathogens In The Oak Family (Fagaceae) Through The Development Of The Oak Conservation Alliance

Richard Turner, Ryan Huish, Adalmaryz Rivera-Gomez, Brooke Colley

Institution: The University of Virginia's College at Wise

The oak family (Fagaceae) represents many ecologically, ethnobotanically, and economically valuable species (including the oaks, chestnuts, and beech). However, multiple pathogenic diseases—such as sudden oak death, oak wilt, and beech bark disease—are threatening their long-term health and conservation. Synergistic, interdisciplinary, and cross-agency collaborations will be required to effectively monitor and plan for these threats. To this end, we are organizing the Oak Conservation Alliance and are seeking allies from research and academic institutions, state agencies, non-governmental organizations, private sectors, community scientists, and other groups to help in the planning process. Forming this alliance will help provide a stronger framework for collaboration, education outreach, and funding opportunities. Community forum discussions have been held, representing stakeholders from various backgrounds who have provided valuable insights to address concerns. Monitoring and educational methods will include the use of mapping technologies, remote sensing, community scientist applications, and various online platforms. Discussions on creating extensive seed banks as a “genetic backup” have begun, as well as strategies to control the movement of disease vectors in the plant nursery trade. Collaborative efforts in prevention, early detection, and planning will be key to success. The resulting data will be funneled into databases for use in future research, including spatial analyses, risk assessments, and ecological impact studies to help study and preserve our valuable ecosystems and heritage in eastern North America.

New Insights From A Broad Review Of Southern African Ethnobotany

Ben-Erik Van Wyk

Institution: University of Johannesburg

Southern Africa is a centre of both cultural and botanical diversity, with 28 different language groups (each with its own ways in which plants are used), and more than 22 000 species of indigenous vascular plants, of which more than 60% are endemic. Of special interest are the San and Khoi cultures, known from molecular data to be the most ancient human lineages on earth. Recent ethnobotanical studies have shown that indigenous knowledge related to the various traditional uses of plants remains incompletely documented. An updated broad review of plant species traditionally used as food, medicine and sources of craft materials, revealed several examples of locally important but scientifically poorly known species. The data showed interesting differences between traditional hunter-gatherers, nomadic pastoralists and sedentary agrarians, not only in the choice of species but also in the way in which food and medicine are used. The nomadic San and Khoi people originally ate both plant foods and medicine fresh and *in situ*, as part of daily foraging, with teas and stews almost certainly of colonial origin. Profound new insights into the value of some plants resulted from a proper interpretation of traditional concepts, followed by scientific exploration and experimental data.

Chakras: An Indigenous Agricultural Practice Enabling Biodiversity Conservation

Roy Vera-Vélez, J Hugo Cota-Sánchez, Jorge E Grijalva

Institution: University of Saskatchewan

Tropical ecosystems have long been influenced by anthropogenic activities. In the Ecuadorian Amazon, the shifting agriculture (SA) system developed by indigenous communities has been an anthropological practice that has modified the structure and integral dynamics of the tropical forest. This common farming activity involves fallow intervals between crop cycles; thus, the quiescent time of the land allows the recovery of soil fertility for subsequent crop seasons. However, the reduction in resting periods has been one of the leading causes of forest degradation. Agroforestry systems (AFSs), locally known as *chakras*, play an important role in buffering environmental degradation caused by the decreasing fallow intervals under SA. In this study, we investigated whether AFSs reverse the effect of reduced SA's fallow intervals in local scale cocoa (*Theobroma cacao*) agrosystems. We aimed to 1) characterize species diversity in this agroecosystem with short fallow periods; 2) predict the ecological impact of intensification of SA on floristic composition, particularly in endangered endemic species; and 3) identify whether changes in floristic composition and species diversity in this agroecosystem under different resting intervals are restricted to certain strata or throughout the plant community. Our findings revealed that tree species diversity decreases across cocoa agroforest established in reduced fallow periods.

Also, the absence of resting intervals of SA affects tree conservation rates in AFSs by changing the floristic composition, in particular, in the upper strata. Nevertheless, the use of AFSs with complex arboreal structures under SA preserves native and endangered endemic species, cultural practices, and natural areas by slowing down forest degradation rates.

Carurú: The Enigmatic Origin Of Brazil's Signature Afro-Brazilian Dish

Robert Voeks

Institution: CSU Fullerton

The hearty green stew known as carurú represents a powerful cultural marker for adherents to Brazilian Candomblé, an African-derived religion that arrived during the slave trade. Based principally on the African cultigens okra and palm oil, carurú is associated in particular with the Ibeji, twin spiritual entities in the Candomblé pantheon. Although various versions of carurú are enjoyed throughout the southern US and the Caribbean, including Louisiana gumbo, Barbados cou cou, Jamaican callaloo, and Haitian kalalou, the origin of this iconic African-American dish is disputed. This presentation explores the significance of carurú to the Afro-Brazilian community, the convoluted ethnobotanical history of the dish, and the current war against carurú being waged by evangelical groups.

Practice And Tenure Of Wild Edible Plants Of The Nilgiri Biosphere Reserve

Wyatt Cole Westerkamp, Monthish Kuttan, Tamara Ticktin, Anita Varghese

Institution: Cornell University

Recent research has focused on the effects of local and global changes on the interactions between local communities and their natural resources. We further examined these interactions by focusing on wild edible plant species in the Nilgiri Mountains, a subset of the Western Ghats in southern India. Specifically, we asked: 1) Which wild edible plants are consumed today and where are they gathered from? and 2) What are perceptions surrounding changes in their availability over time and the potential causes? We worked in five villages: three in high-elevation shola-grassland complexes and two in low-elevation dry forests. We collected inventories through 50 semi-structured interviews and participatory walks, documenting the local name, habit, habitat, season, and preparation for each wild edible plant mentioned. We also held focus group discussions with men and women separately in each village, in which participants ranked the use and availability of each species and how these have changed over time. We documented between 28 and 42 wild edible species per village. The plant part most frequently reported was fruit, although tubers, shoots, greens, stems, barks, and mushrooms were also mentioned. Forest was the most frequently mentioned collection site in both low and high elevation villages. Trends in wild edible plant availability differed between elevations: in low elevation villages 35% of plants were perceived to be declining and 24% increasing, while these values were 63% and 8% respectively in high elevation villages. Despite these differences, we found several recurring motifs across villages: decreasing rainfall, increasing agrochemical use, exotic plant invasion, and increasing use by wildlife were all perceived to be major threats to the availability of many wild edible plants. Future ecological research can complement these findings and help identify strategies to conserve declining species that are important to the communities.

Half A Lifetime Of Polynesian Ethnobotany

Art Whistler

Institution: University of Hawaii Botany Department

Polynesia is a vast region in the Pacific Ocean that was discovered and colonized by ancient explorers sailing in double-hauled voyaging canoes. The intrepid Polynesian sailors discovered and settled nearly every inhabitable island in the region. Although possessing a large native flora, the islands are generally devoid of food and other essential native plants, so in order to sustain life on the distant islands, the explorers carried with them a suite of over 60 "canoe plants" to allow the settlers to survive and thrive in the insular environment. The plants and the ways they were used comprise the ethnobotany of Polynesia. With the advent of Europeans, the islanders quickly began losing their plant knowledge as well as the once-useful plants themselves. Exacerbating the situation was the passing of the elders who knew the plants and their uses, but did not record this botanical heritage. With this backdrop, in 1983 the author started collecting ethnobotanical plants, interviewing informants, and assembling the disappearing knowledge, first with the National Tropical Botanical Garden for nine years, then for 25 years on his own as he conducted other botanical studies throughout Polynesia. Some of the plants have entirely disappeared

from the islands, but some rare ones have been collected, propagated, and given to others to grow. In 2009 the author published an ethnobotanical flora of Polynesia (*Plants of the Canoe People*), and now after 36 years into the project, he is summarizing his work with the preparation of a comprehensive ethnobotany of Polynesia hopefully to be published next year. This presentation shows some of the aspects of the work he is conducting and has conducted as the project nears completion.

Native Maize Varieties And Ideas Of Purity And Contamination In San Miguel Del Valle, Oaxaca

Adele Woodmansee

Institution: Harvard College

The state of Oaxaca, Mexico is the center for the origin and diversity of maize (*Zea mays*). This diversity is threatened as free trade agreements and climate change limit the ability of subsistence farmers to continue agricultural production. My research seeks to understand value systems around locally produced maize in a Zapotec community, San Miguel del Valle, where agriculture is now a secondary economic activity for most families. I am combining ethnographic research on agricultural practices with genetic research to test for transgenic contamination in local maize varieties. My research will provide insight into how Oaxacan communities live with and address threats to their local seeds and agricultural practices. San Miguel experiences frequent droughts, exacerbated by climate change. Along with lack of government support for subsistence farmers in Mexico, this forces families to seek other sources of income, including international migration and craft production. Importation of maize into Oaxacan communities threatens local agricultural practices and seeds, as is evident in cases of documented transgenic contamination in native Oaxacan maize. But many families in San Miguel continue to produce some of their own maize using non-mechanized production methods to grow native maize varieties in steep, dry, and rocky fields with no irrigation. Residents use the term *criollo* to differentiate locally produced crops and livestock from imported foods. They justify preference for local maize varieties by referencing low chemical use and knowledge about production - even though most families now buy most of the grain they consume from outside sources. Understanding how families make choices about their seeds is important because local maize production continues to play an important role in community relations and family economies even if it is not viable as a source of income, and native maize varieties are essential to food security in Mexico.

The Use Of Palm (Arecaceae) In Maya Ritual

Andrew Wyatt

Institution: Middle Tennessee State University

The Maya of the both past and present use a wide variety of plants in ritual activity. Plants are utilized in multiple contexts by the Maya; they are consumed by ritual participants, presented as offerings, and are used in the production and creation of ritual paraphernalia, including the construction of altars and shrines. Researchers have studied the broad use of these plants, as well as focusing on different individual species and in what contexts they are implemented. In this presentation I will focus primarily on the use of palm (Arecaceae) in the construction of altars and shrines, both as the foundational structure and as decoration. Palms represent a diverse family in the American Neotropics, with over 100 families, although palms demonstrating significant use by the Maya number less than 20. Much of the research on palms has focused primarily on their use as a food source or in the construction of households and other secular structures. However, archaeobotanical analysis has identified palm in different ritual contexts. In particular, Stela Cave in Belize has provided a significant evidence of the ritual use of palm by the ancient Maya. To the ancient Maya, caves served as portals to the underworld, functioning as sites where ritual practitioners could be in closer contact with important deities and enact rites associated with natural forces. The Belize River Valley has been a significant area for cave exploration and excavation, and Stela Cave, located in the Cayo District in western Belize, has provided a rich source of data for understanding this ritual role of caves. The Maya utilized Stela Cave from the Late Preclassic period (ca. 200 B.C.) through the more recent historic period, and excavations yielded a substantial quantity of archaeobotanical remains. In this presentation, we discuss the archaeobotanical assemblage from Stela Cave, focusing on the role of palm and its importance in Precolumbian Maya cave ritual. We will further discuss the role of palm in Mesoamerican ritual in general, the different ways it is utilized, and how research on palm can contribute to a greater understanding of ritual activity.

The Use Of "Use Value": Quantifying Importance In Ethnobotany

Jasmine Zenderland, Robbie Hart, Rainer w Bussmann, Narel Y Paniagua-Zambrana, Shalva Sikharulidze, Zaal Kikvidze, David Kikodze, David Tchelidze, Manana Khutsishvili, Ketevan Batsatsashvili

Institution: Humboldt State University

Use-Value (UV) is an index widely used to quantify the relative importance of useful plants. It combines the frequency with which a species is mentioned with the number of uses mentioned per species, and is often used to highlight prominent species of interest. However, high-UV species are often disproportionately cultivated species, with wild-collected plants ranking lower. To better understand this pattern, and to determine if it is present in the broader ethnobotanical literature, we reviewed an array of papers with results on UV and cultivation status, and analyzed in depth data from two large ethnobotanical studies in The Republic of Georgia in the Caucasus. In addition to looking for differences in UV by cultivation status, we compared the two best-populated categories of use (medicinal and food uses) and the components of UV (relative frequency of citation and number of uses mentioned per species). We found that UV was higher in cultivated plants than wild plants in both the Caucasus datasets and the 17 studies overall. Medicinal plants did not exhibit this trend, as medicinal wild plants had marginally higher UV than medicinal cultivated plants. Relative frequency of citation had a substantial effect on UV, in contrast to number of uses mentioned for a given plant. In sum, UV seems subject to some obscured biases which are important to consider in the context of each study.

Range Wide Study Of Goldenseal (*Hydrastis canadensis* L.) Trade, Buying Practices, And Stakeholder Perceptions Around Conservation

Grady Zuiderveen, Eric Burkhart, Michael Jacobson

Institution: Pennsylvania State University

The sustainability of commercial harvest of wild goldenseal to supply the herbal products industry has long been questioned. Concerns over unsustainable wild digging led to the listing of goldenseal in Appendix 2 of the Convention on the International Trade of Endangered Species of Flora and Fauna (CITES)—an international treaty aimed at conserving species that are vulnerable to human exploitation. Despite concerns, there is limited information regarding state-level wild goldenseal harvest, trade, and conservation efforts in the United States. To better understand these, and perceptions of involved stakeholders, surveys were sent to registered ginseng dealers (many of whom also handle goldenseal and other wild roots) and state ginseng coordinators of states within the native range of goldenseal. Findings revealed that trade was much more common in goldenseal's core range (82% of dealers reported purchasing goldenseal) than in states considered at the edge of goldenseal's native distribution (43% of dealers reported purchasing goldenseal). Further, dealers in core states, on average, purchased greater amounts of goldenseal on a more regular basis than dealers in states at the edge of the range. Across the range, over 70% of respondents indicated that they handled only wild harvested goldenseal. Dealers' perceptions of the need for conservation differ by their geographic location within the trade range and their age demographic. Dealers at the edge of the range and younger generations viewed goldenseal regulations, and regulations in general, more favorably than dealers in the core of the range and older generations. These results indicate that goldenseal is being harvested across its range to a varying degree, and this variation in harvest pressure requires more regional and informed state-level conservation response. Industry partnered tracking of trade at the state level would help inform conservation (and cultivation) efforts but is currently not done in any states.

Code of Conduct

All members of the Society for Economic Botany (or attendees of the Society's functions) are required to follow the Society's Code of Conduct for Meetings. This includes, but is not limited to, any Society conference, other meeting, function, event, or professional activity. Behavior of the Society's members reflects on the reputation of the Society and should create a safe and professional atmosphere free of harassment, stalking, threats, abusive conduct, and bullying whether physical or verbal. Any member or attendee participating in these unwanted behaviors risk expulsion (without refund) from the event and the Society as well as further consequences including the involvement of local law enforcement.

- Society members (and attendees of Society's functions) are expected to:
- Not harass another based on race, national origin, religion, gender, sexual orientation, gender identity or expression, civil union or marital status, age, citizenship status, disability, pregnancy, ancestry or medical condition.
- Not sexually harass another in the form of unwanted behavior of a sexual nature whether physical or verbal that includes, but is not limited to, unwelcome sexual advances or requests for sexual favors.
- Present research and statements on other cultures or individuals in a respectful manner. Critique presentations and research with a focus on the presentation and work, not on the individual.
- Not purposefully disrupt oral and poster presentations.
- Not record or transmit audio, video, or images of oral or poster presentations without author approval.
- Speak up if a member (or event attendee) has done or is doing something that is against the Society's Code of Conduct or Guidelines on Ethics and understand that retaliation for complaints will not be tolerated*.

*Report activity contrary to these codes by contacting a Society officer, starting with the president (contact information can be found on the society website or at the registration desk at meetings). Contact another society officer if the first attempt is unsuccessful. Understand that the first step will be two society officers approaching the accused and requesting the offending behavior to stop and that subsequent steps will be conducted as necessary. Know that confidentiality will be maintained if possible and that local police should be contacted for threats to public safety and criminal acts.

The Code of Conduct can be found on the Society for Economic Botany's website at:
<http://www.econbot.org/index.php?module=content&type=user&func=view&pid=129>.

Resources

1) lactation spaces on campus:

- Steger 681 – Go to Student Wellness Center, 675 Steger Student Life Building for access.
- French West 6440
- Old Chem 618A
- Edwards 5103
- DAAP 4470V
- TUC 431- Access granted by request at the MainStreet Connection Center upon arrival. *If the MainStreet Connection Center is closed you can call [513-266-8942](tel:513-266-8942) to reach a TUC operations team member to request access.*
- Van Wormer – room #360
- Linder Hall Business College – room # 10 S
- Teachers/Dyers Complex - room # 538

2) Children spaces on campus:

- Place to learn, play, and unwind - Arlitt PlayScape, adjacent to the north end of French Hall.
- Place learn and relax - The CECH Library contains children's books and other resources.

3) If you need a place for Meditation, Prayer, or Yoga, there are dedicated spaces in the Langsam Library



www.econbot.org