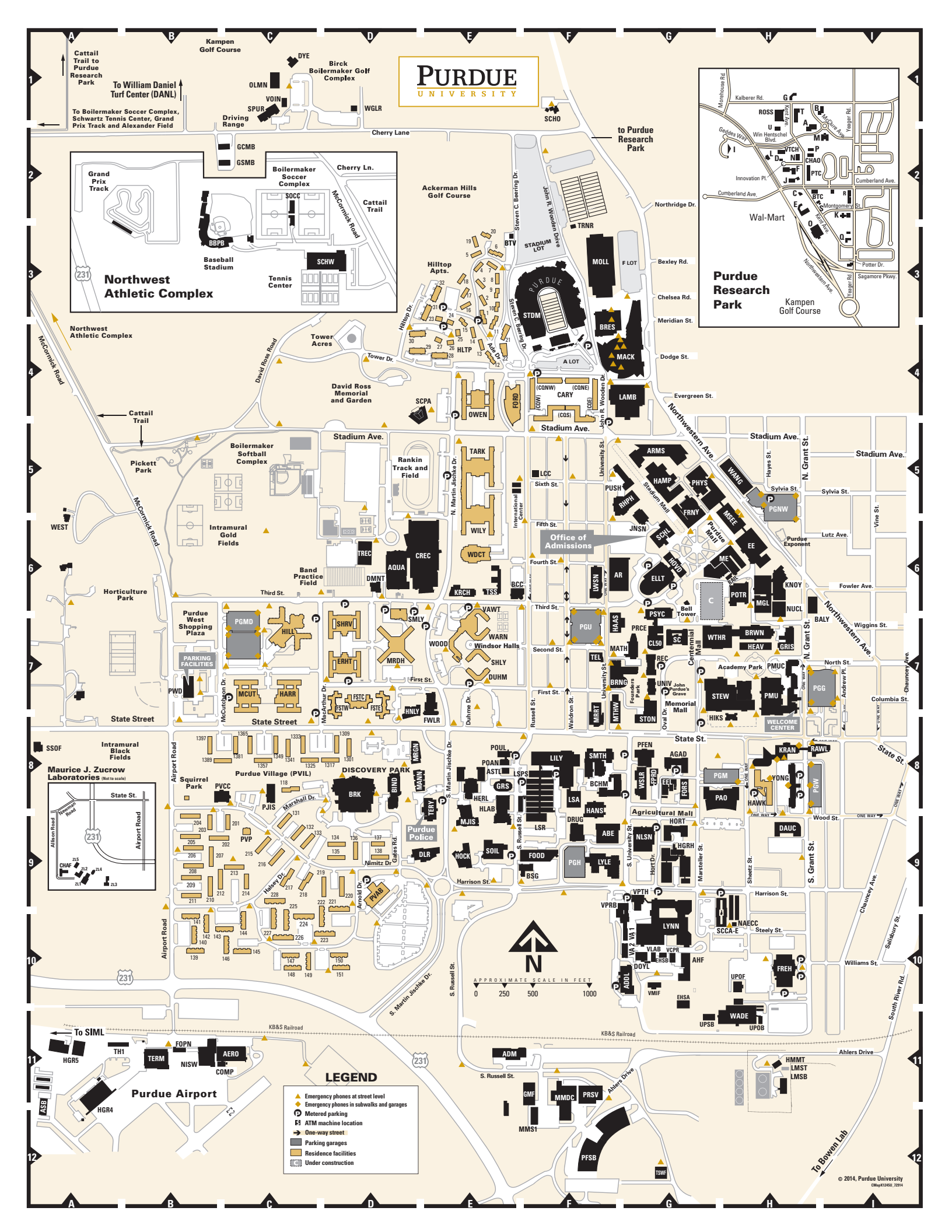
# 2015 Annual Meeting
# LEPIDOPTERISTS' SOCIETY


Purdue Conferences, Entomology and Research Collection Presents
64th Annual Meeting of the Lepidopterists' Society
Stewart Center • Purdue University


PURDUE UNIVERSITY
Kampen Golf Course
Cattail Trail to Purdue Research Park
To William Daniel Turf Center (DANL)
To Boilermaker Soccer Complex, Schwartz Tennis Center, Grand Prix Track and Alexander Field
Driving Range
Birck Boilermaker Golf Complex
DYE
OLMN
VOIN
SPUR
WGLR
SCHO
Cherry Lane
to Purdue Research Park
GCMB
GSMB
Boilermaker Soccer Complex
Cherry Ln.
Grand Prix Track
SOCC
McCormick Road
Cattail Trail
BBPB
Baseball Stadium
SCHW
Tennis Center
Northwest Athletic Complex
231
Ackerman Hills Golf Course
Steven C. Beering Dr.
John R. Wooden Drive
Northridge Dr.
TRNR
BTV
STADIUM LOT
Hilltop Apts.
Hilltop Dr.
HLTP
Ada Dr.
STDM
MOLL
F LOT
Bexley Rd.
Chelsea Rd.
Meridian St.
BRES
MACK
A LOT
Dodge St.
Tower Acres
Tower Dr.
David Ross Memorial and Garden
SCPA
OWEN
FORD
(CONW)
(CONE)
CARY
(COW)
(COE)
(COS)
LAMB
Evergreen St.
Northwestern Ave.
Stadium Ave.
Cattail Trail
Pickett Park
Boilermaker Softball Complex
Rankin Track and Field
N. Martin Jischke Dr.
TARK
WILY
WDCT
LCC
Sixth St.
Fifth St.
Fourth St.
Third St.
Second St.
First St.
University St.
International House
ARMS
HAMP
PUSH
RHPH
PHYS
FRNY
WANG
MSEE
PGNW
Sylvia St.
Hayes St.
N. Grant St.
Vine St.
Stadium Mall
Purdue Mall
JNSN
SCHE
Office of Admissions
EE
ME
HOVD
ELLT
AR
LWSN
Purdue Exponent
Lutz Ave.
Fowler Ave.
KNOY
POTR
MGL
NUCL
BALY
Wiggins St.
Bell Tower
C
PSYC
PRCE
CL50
SC
WTHR
BRWN
HEAV
GRIS
HAAS
PGU
MATH
TEL
REC
BRNG
Founders Park
Centennial Mall
Academy Park
PMUC
North St.
Columbia St.
Andrew Pl.
Chauncey Ave.
PGG
STEW
PMU
HIKS
WELCOME CENTER
UNIV
John Purdue's Grave
Memorial Mall
MRHT
MTHW
STON
Oval Dr.
Waldron St.
Russell St.
Duhme Dr.
Intramural Gold Fields
TREC
CREC
AQUA
DMNT
Band Practice Field
KRCH
TSS
BCC
VAWT
WARN
Windsor Halls
WOOD
SHLY
OUHM
SMLY
SHRV
MRDH
ERHT
FSTC
FSTW
FSTE
HNLY
FWLR
MacArthur Dr.
Horticulture Park
WEST
Purdue West Shopping Plaza
PGMD
HILL
PARKING FACILITIES
PWD
MCUT
HARR
McCutcheon Dr.
State Street
Intramural Black Fields
SSOF
Maurice J. Zucrow Laboratories (Not to scale)
State St.
Newman Road
Allison Road
Airport Road
231
CHAF
ZL5
ZL2
ZL4
ZL1
ZL3
Airport Road
Squirrel Park
PVCC
Purdue Village (PVIL)
DISCOVERY PARK
BRK
BIND
MANN
MRGN
PJIS
Marshall Dr.
PVP
Halsey Dr.
Nimitz Dr.
Gates Rd.
DLR
Purdue Police
TERY
PVAB
Arnold Dr.
S. Martin Jischke Dr.
POUL
POAN
ASTL
LSPS
GRS
HERL
HLAB
MJIS
LILY
SMTH
BCHM
LSA
HANS
DRUG
LSR
ABE
HOCK
SOIL
FOOD
BSG
PGH
LYLE
HORT
NLSN
HGRH
Agricultural Mall
PFEN
AGAD
WSLR
FPHD
FEL
FORS
PAO
PGM
KRAN
RAWL
YONG
HAWK
PGW
DAUC
Wood St.
ONE WAY
Harrison St.
Marsteller St.
Shertz St.
S. Grant St.
VPTH
VPRB
LYNN
VA 1
VA 2
VLAB
VCPR
EHSB
AHF
DOYL
ADDL
VMIF
EHSA
NAECC
SCCA-E
Steely St.
Salisbury St.
Williams St.
South River Rd.
UPOF
FREH
WADE
UPSB
UPOB
KB&S Railroad
To SIML
HGR5
TH1
TERM
FOPN
NISW
AERO
COMP
HGR4
ASB
Purdue Airport
ADM
S. Russell St.
GMF
MMDC
PRSV
MMS1
PFSB
TSWF
Ahlers Drive
HMMT
LMST
LMSB
To Bowen Lab
APPROXIMATE SCALE IN FEET
0
250
500
1000
LEGEND
Emergency phones at street level
Emergency phones in subwalks and garages
Metered parking
ATM machine location
One-way street
Parking garages
Residence facilities
Under construction
Purdue Research Park
Kampen Golf Course
Morehouse Rd.
Kalberer Rd.
Win Hentschel Blvd.
Yeager Rd.
McClure Ave.
Geddes Way
Innovation Pl.
Cumberland Ave.
Wal-Mart
Montgomery St.
Northwestern Ave.
Potter Dr.
Sagamore Pkwy.
ROSS
VTCH
CHAO
PTC
BTC
Mart Ave.
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CMapK1245U_72514

# PURDUE UNIVERSITY

# West Lafayette Campus

BUILDING NAMES AND ABBREVIATIONS
FALL 2014

**ABE** Agricultural and Biological Engineering **F9**
**ADDL** Animal Disease Diagnostic Laboratory **G10**
**ADM** ADM Agricultural Innovation Center **E11**
**AERO** Aerospace Science Laboratory **C11**
**AGAD** Agricultural Administration Building **G8**
**AHF** Animal Holding Facility **G10**
**AQUA** Boilermaker Aquatic Center **D6**
**AR** Armory **G6**
**ARMS** Armstrong (Neil) Hall of Engineering **G5**
**ASB** Airport Service Building (Shop Services) **A11-12**
**ASTL** Animal Sciences Teaching Laboratory **E8**
**BALY** Bailey (Ralph and Bettye) Hall **H6-7**
**BCC** Black Cultural Center **F6**
**BCHM** Biochemistry Building **F8**
**BIND** Bindley Bioscience Center **D8**
**BRES** Brees (Drew and Brittany) Student-Athlete Academic Center **F3**
**BRK** Birck Nanotechnology Center **D8**
**BRNG** Beering (Steven C.) Hall of Liberal Arts and Education **F, G7**
**BRWN** Brown (Herbert C.) Laboratory of Chemistry **H7**
**BSG** Building Services and Grounds **F9**
**BTV** Boiler Television Building **E3**
■ Car/Van Rentals and Charter Bus (PFSB) **F12**
† **CHAF** Chaffee Hall **A9**
**CL50** Class of 1950 Lecture Hall **G7**
**COMP** Composites Laboratory **C11**
**CREC** Córdova (France A.) Recreational Sports Center **D, E6**
‡ **DANL** Daniel (William H.) Turfgrass Research Center **B1**
**DAUC** Dauch (Dick and Sandy) Alumni Center **H9**
**DLR** Hall for Discovery and Learning Research **E9**
**DMNT** DeMent (Clayton W.) Fire Station **D6**
**DOYL** Doyle (Leo Philip) Laboratory **G10**
**DRUG** Drug Discovery **F9**
**DYE** Pete Dye Clubhouse **C1**
**EE** Electrical Engineering Building **H6**
**EEL** Entomology Environmental Laboratory **G8**
**EHSA** Equine Health Sciences Annex **G10**
**EHSB** Equine Health Sciences Building **G10**
**ELLT** Elliott (Edward C.) Hall of Music **G6**
**EXPT** *Exponent* Building **H6**
**FOOD** Food Stores Building **F9**
**FOPN** Flight Operations Building **B11**
**FORS** Forestry Building **G8**
**FPRD** Forest Products Building **G8**
**FREH** Freehafer (Lytle J.) Hall of Administrative Services **H10**
**FRNY** Forney Hall of Chemical Engineering **G5**
**FWLR** Fowler (Harriet O. and James M., Jr.) Memorial House **E7**
**GCMB** Golf Course Maintenance Barn **C2**
**GMF** Grounds Maintenance Facility **F11**
■ Grand Prix Track (see Northwest Athletic Complex Inset)
**GRIS** Grissom Hall **H7**
**GSMB** Golf Storage Maintenance Building **C2**
**HAAS** Haas (Felix) Hall **G7**
**HAMP** Hampton (Delon and Elizabeth) Hall of Civil Engineering **G5**
**HANS** Hansen (Arthur G.) Life Sciences Research Building **F8, 9**
**HEAV** Heavilon Hall **H7**
**HERL** Herrick Acoustics **E8**
**HGR4-6** Hangars, Numbers 4 through 6 **A11,12**
**HGRH** Horticultural Greenhouse **G9**
**HIKS** Hicks (John W.) Undergraduate Library **G, H7, 8**
**HLAB** Herrick Laboratories **E8-9**
**HMMT** Hazardous Materials Management Trailer **H11**
**HNLY** Hanley (Bill and Sally) Hall **C7**
**HOCK** Hockmeyer (Wayne T. and Mary T.) Hall of Structural Biology **E9**
**HORT** Horticulture Building **G9**
**HOVD** Hovde (Frederick L.) Hall of Administration **G6**
**JNSN** Johnson (Helen R.) Hall of Nursing **G5, 6**
**KCTR** Krannert Center for Executive Education and Research **H8**
**KNOY** Knoy (Maurice G.) Hall of Technology **H6**
**KRAN** Krannert Building **H8**
**KRCH** Krach Leadership Center **E6**
**LAMB** Lambert (Ward L.) Fieldhouse and Gymnasium **F, G4**
**LCC** Latino Cultural Center (600 Russell St.) **F5**
■ Library, Main (see HIKS) **G, H7, 8**
**LILY** Lilly Hall of Life Sciences **F8**
**LMSB** Laboratory Materials Storage Building **H11**
**LMST** Laboratory Materials Storage Trailer **H11**
**LSA** Life Science Animal Building **F8**
**LSPS** Life Science Plant and Soils Laboratory **F8**
**LSR** Life Science Ranges (Greenhouse and Service Building) **F8, 9**
**LWSN** Lawson (Richard and Patricia) Computer Science Building **F6**
**LYLE** Lyles-Porter Hall **F9**
**LYNN** Lynn (Charles J.) Hall of Veterinary Medicine **G10**
**MACK** Mackey (Guy J.) Arena **F, G4**
**MANN** Mann (Gerald D. and Edna E.) Hall **E8**
**MATH** Mathematical Sciences Building **G7**
**ME** Mechanical Engineering Building **G, H6**
**MGL** Michael Golden Engineering Laboratories and Shops **H6**
**MJIS** Jischke (Martin C.) Hall of Biomedical Engineering **E9**
**MMDC** Materials Management and Distribution Center **F11**
**MMS1** Materials Management Storage Building 1 **F12**
**MOLL** Mollenkopf Athletic Center **F3**
**MRGN** Morgan (Burton D.) Center for Entrepreneurship **E8**
**MRRT** Marriott Hall **F7,8**
**MSEE** Materials and Electrical Engineering Building **H5, 6**
**MTHW** Matthews Hall **F7, 8**
**NAECC** Native American Educational and Cultural Center (South Campus Courts, Building B) **H10**
**NLSN** Nelson (Philip E.) Hall of Food Science **G9**
**NISW** Niswonger Aviation Technology Building **B11**
**NUCL** Nuclear Engineering Building **H6**
**OLMN** Ollman (Melvin L.) Golfcart Barn **C1**
■ Parking Facilities (Purdue West, Building D) **B7**
**PAO** Pao (Yue-Kong) Hall of Visual and Performing Arts **H8**
**PFEN** Pfendler (David C.) Hall of Agriculture **G8**
**PFSB** Physical Facilities Service Building **F12**
**PHYS** Physics Building **G5**
**PJIS** Jischke (Patty) Early Care and Education Center **C8**
**PMU** Purdue Memorial Union (includes Welcome Center) **H7**
**PMUC** Purdue Memorial Union Club **H7**
**POAN** Poultry Science Annex **E8**
**POTR** Potter (A.A.) Engineering Center **H6**
**POUL** Poultry Science Building **E8**
**PRCE** Peirce Hall **G7**
**PRSV** Printing Services Facility **F11**
**PSYC** Psychological Sciences Building **G6, 7**
**PUSH** Purdue University Student Health Center **F, G5**
**PVAB** Purdue Village Administration Building **D9**
**PVCC** Purdue Village Community Center **C8**
**PWD** Parking Facilities **B7**
**RAIL** American Railway Building **H6**
**RAWL** Rawls (Jerry S.) Hall **H8**
**REC** Recitation Building **G7**
**RHPH** Heine (Robert E.) Pharmacy Building **F, G5**
**SC** Stanley Coulter Hall **G7**
**SCCA-E** South Campus Courts, Buildings A-E **G, H9, 10**
**SCHL** Schleman (Helen B.) Hall of Student Services **G6**
**SCHO** Global Policy Research Institute (Schowe House) **F1**
**SCPA** Slayter Center of Performing Arts **D4**
‡ **SIML** Holleman-Niswonger Simulator Center
**SMLY** Smalley (John C.) Center for Housing and Food Services Administration **D6, 7**
**SMTH** Smith Hall **F8**
**SOIL** Soil Erosion Laboratory, National **E9**
**SPUR** Spurgeon (Tom) Golf Training Center **C1**
**SSOF** State Street Office Facility **A8**
**STDM** Ross-Ade Stadium (includes Ross-Ade Pavilion [RAP]) **F3**
**STEW** Stewart Center **G, H7**
**STON** Stone (Winthrop E.) Hall **G7, 8**
■ Student Health Center (see PUSH) **F, G5**
**TEL** Telecommunications Building **F7**
**TERM** Terminal Building **B11**
**TERY** Terry (Oliver P.) House **E8, 9**
**TH1-6** Tee-Hangars 1 through 6 **A11**
**TREC** Turf Recreation Exercise Center **D6**
**TSWF** Transportation Service Wash Facility **G12**
**UNIV** University Hall **G7**
**UPOB** Utility Plant Office Building **H11**
**UPOF** Utility Plant Office Facility **H10**
**UPSB** Utility Plant Storage Building **G11**
**VA1** Veterinary Animal Isolation Building 1 **G10**
**VA2** Veterinary Animal Isolation Building 2 **G10**
**VCPR** Veterinary Center for Paralysis Research **G10**
■ Visitor Information Center (now the Welcome Center — east end of PMU) **H7**
**VLAB** Veterinary Laboratory Animal Building **G10**
**VMIF** Veterinary Medicine Isolation Facility **G10**
**VOIN** Voinoff (Samuel) Golf Pavilion **C1**
**VPRB** Veterinary Pathobiology Research Building **F, G9, 10**
**VPTH** Veterinary Pathology Building **G9**
**WADE** Wade (Walter W.) Utility Plant **H11**
**WANG** Wang (Seng-Liang) Hall **H5**
■ Welcome Center (see PMU) **H7**
**WEST** Westwood (President's Home) **A5, 6**
**WGLR** Women's Golf Locker Room **D1**
**WSLR** Whistler (Roy L.) Hall of Agricultural Research **G8**
**WTHR** Wetherill (Richard Benbridge) Laboratory of Chemistry **G, H7**
**YONG** Young (Ernest C.) Hall **H8**
† **ZL1** Combustion Research Laboratory
† **ZL2** Gas Dynamics Research Laboratory
† **ZL3** High Pressure Research Laboratory
† **ZL4** Propulsion Research Laboratory
† **ZL5** Turbomachinery Fluid Dynamics Laboratory

## Residence & Dining Facilities

**CARY** Cary (Franklin Levering) Quadrangle **F4**
* **DUHM** Duhme (Ophelia) Residence Hall **E7**
**ERHT** Earhart (Amelia) Residence Hall **D7**
**FORD** Ford (Fred and Mary) Dining Court **F4**
**FST** First Street Towers **D7**
**HARR** Harrison (Benjamin) Residence Hall **C7**
**HAWK** Hawkins (George A.) Hall **H8**
**HILL** Hillenbrand Residence Hall **C7**
**HLTP** Hilltop Apartments **E3**
**MCUT** McCutcheon (John T.) Residence Hall **C7**
**MRDH** Meredith (Virginia C.) Residence Hall **D7**
**OWEN** Owen (Richard) Residence Hall **E4**
**PVAB** Purdue Village Administration Building **D9**
**PVCC** Purdue Village Community Center **C8**
**PVIL** Purdue Village **B, C, D8, 9, 10**
**PVP** Purdue Village Preschool **C9**
* **SHLY** Shealy (Frances M.) Residence Hall **E7**
**SHRV** Shreve (Eleanor B.) Residence Hall **D6, 7**
**SMLY** Smalley (John C.) Center for Housing and Food Services Administration **D6, 7**
**TARK** Tarkington (Newton Booth) Residence Hall **E5**
**TSS** Third Street Suites **E6**
* **VAWT** Vawter (Everett B.) Residence Hall **E6**
* **WARN** Warren (Martha E. and Eugene K.) Residence Hall **E7**
**WDCT** Wiley Dining Court **E6**
**WILY** Wiley (Harvey W.) Residence Hall **E5, 6**
* **WOOD** Wood (Elizabeth G. and William R.) Residence Hall **E7**

## Northwest Athletic Complex (C2-3 inset)

**BBPB** Alexander (John and Anna Margaret Ross) Field
**SOCC** Boilermaker Soccer Complex
**SCHW** Schwartz (Dennis J. and Mary Lou) Tennis Center

## Parking Garages

**PGG** Parking Garage, Grant Street **H, I7**
**PGH** Parking Garage, Harrison Street **F9**
**PGM** Parking Garage, Marsteller Street **G, H8**
**PGMD** Parking Garage, McCutcheon Drive **C6, 7**
**PGNW** Parking Garage, Northwestern Avenue **H5**
**PGU** Parking Garage, University Street **F6, 7**
**PGW** Parking Garage, Wood Street **H8**

## Other Maps

Maps are available in the publications racks in Hovde Hall, the Memorial Union, Purdue Airport, the Welcome Center, and from the Office of the Dean of Students and Purdue Marketing and Media. This includes the *Campus Accessibility Guide* for people with disabilities; Parking Facilities offers *Parking Guide* maps.

* Windsor Residence Halls
† Part of Maurice J. Zucrow Laboratories
‡ Buildings not appearing on map

## *Program and Local Arrangements*

***Meeting Chair:*** *Jennifer M. Zaspel*

***Program Committee:*** *Jennifer M. Zaspel, Timothy Anderson, Julia Snyder, Elena Ortiz*

***Registration Coordinator:*** *Sandra Oswalt*

***Conferences Coordinators:*** *Abbey Stoutenborough, Shannon Borneman*

***Field Trip Coordinators:*** *Jennifer M. Zaspel, John Shuey, Timothy Anderson and Gareth Powell*

***Meeting Logo:*** *Branden Apitz*

***Photography:*** *John Obermeyer*

***Session Moderators:*** *Timothy Anderson, Elena Ortiz, Megan McCarty, Julia Snyder, Jennifer M. Zaspel, Crystal Purcell, Alberto Zilli, Delano Lewis, Jacqueline Y. Miller, and Chris Grinter*

***Collections Access:*** *Gino Nearns (PERC), Chris Grinter (INHS)*

***Transportation:*** *Jennifer M. Zaspel, Abbey Stoutenborough, Shannon Borneman*

***Door Prizes:*** *Charles V. Covell, Jr.*

***Sponsors:*** *BioQuip Products, Indiana Nature Conservancy, Leptraps, LLC, Adam's Mill on Wildcat Creek, PERC and Purdue Entomology Department*

# *Schedule of Events*

# *28 July – 2 August 2015*

**Monday, 27 July 2015**

**8:00 a.m. – 4:30 p.m.:** Residence hall housing check-in:
**First Street Towers – Check-in at Main Office**
**Earhart Hall – Check-in located in Lobby**
**9:00 a.m.:** Depart for field trip to Muscatatuck NWR (Bus will depart outside the Union Club Hotel on Grant Street), box lunches will be provided
**5:00 p.m.:** Return from Muscatatuck NWR to Purdue Memorial Union

**Tuesday, 28 July 2015**

**8:00 a.m. – 4:30 p.m.:** Residence hall housing check-in:
**First Street Towers – Check-in at Main Office**
**Earhart Hall – Check-in located in Lobby**
**10:30 a.m.:** Depart for field trip to Kankakee Sands (bus will depart outside the Union Club Hotel on Grant Street), lunch at Fair Oaks Dairy Farm (11:30-12:45)
**9:00 a.m. – 4:00 p.m.:** Executive Council Meeting in Smith 131 Entomology. Lunch and snacks provided by the Purdue Entomological Research Collection (PERC)
**4:45 p.m.:** Return from Kankakee Sands to Purdue Memorial Union
**5:00 p.m. – 8:00 p.m.:** BioQuip Products (https://www.bioquip.com/) Reception and continued registration West Faculty Lounge, 2nd floor Purdue Memorial Union (light hors d'oeuvres and drink ticket provided)

**Wednesday, 29 July 2015**

**8:00 a.m. – 12:00 p.m.:** Registration and program continues **Stewart Center (STEW 302-306)**
**8:00 a.m. – 8:15 a.m.:** Announcements and welcoming remarks
**8:15 a.m. – 8:30 a.m.:** Introduction to student-organized symposium **"A chemical conga: Lepidoptera and host-plant secondary chemistry"**
**8:30 a.m. – 10:00 a.m.:** Symposium speakers
**10:00 a.m. – 10:30 a.m.:** BREAK
**10:30 a.m. – 12:00 p.m.:** Symposium speakers
**12:00 p.m. – 1:30 p.m.:** Lunch (on your own)
**1:30 p.m. – 3:30 p.m.:** Contributed papers
**3:30 p.m. – 3:45 p.m.:** BREAK
**3:45 p.m. – 4:30 p.m.: Keynote speaker I, Charlie Covell, "*Evolution of the moth collection at the McGuire Center for Lepidoptera and Biodiversity, 2004 - 2015*"**
**4:30 p.m. – 5:15 p.m.:** Membership meeting
**6:30 p.m.:** Depart for black lighting at the Adam's Mill on the Wildcat Creek (Meet at Purdue Memorial Union Club Hotel)
**11:30 p.m.:** Return to Purdue Memorial Union Club Hotel on Grant street

**Thursday, 30 July 2015**

**8:00 a.m. – 12:00 p.m.:** Registration and program continues **Stewart Center (STEW 302-306)**
**8:00 a.m. – 8:15 a.m.:** Announcements and opening remarks
**8:15 a.m. – 10:00 a.m.:** Student oral presentations I
**10:00 a.m. – 10:30 a.m.:** BREAK
**10:30 a.m. – 12:00 p.m.:** Student oral presentations II
**12:00 p.m. – 1:30 p.m.:** Lunch (on your own)
**1:30 p.m. – 3:00 p.m.:** Contributed papers
**3:00 p.m. – 4:00 p.m.:** Poster session, vendors & ice cream social (novelties provided by Leptraps, LLC)
**4:00 p.m. – 4:30 p.m.: Keynote speaker II, Geoff Martin, "*iCollections project: the digitisation of the British & Irish Lepidoptera collection at the Natural History Museum, London*"**
**4:30 p.m. – 5:15 p.m.:** Business Meeting

**Friday, 31 July 2015**

**8:00 a.m. – 12:00 p.m.:** Registration and program continues **Stewart Center (STEW 302-306)**
**8:00 a.m. – 8:15 a.m.:** Announcements and opening remarks
**8:15 a.m. – 10:00 a.m.:** Contributed papers
**10:00 a.m. – 10:30 a.m.:** BREAK
**10:30 a.m. – 12:00 p.m.:** Contributed papers
**12:00 p.m. – 1:30 p.m.:** Lunch (on your own)
**1:30 p.m. – 2:00 p.m.:** Group photograph (please meet at STEW for instructions 302-306)
**2:00 p.m. – 3:00 p.m.: Keynote Speaker III, John Shuey, "*An Overview of Indiana Habitats and Conservation*"**
**3:00 p.m. – 3:15 p.m.:** Break
**3:00 p.m. – 4:00 p.m.:** Poster removal
**5:30 p.m.:** Meet bus to depart for West Lafayette Country Club (WLCC) BBQ and live jazz music ***Danny Weiss Trio*** (bus will depart outside of the Purdue Memorial Union Club Hotel on Grant street)
**5:45 p.m.:** Depart for West Lafayette Country Club
**6:00 p.m.:** West Lafayette Country Club Reception
**7:00 p.m.:** West Lafayette Country Club Dinner
**8:45 p.m.:** Depart for Purdue Memorial Union Club Hotel

**Saturday, 1 August 2015**

**7:45 a.m.:** Meet for group excursion Shades State Park (bus will depart outside of the Purdue Memorial Union Club Hotel on Grant street)
**8:00 a.m.:** Depart for group excursion, transportation provided by Purdue Entomology
**12:00 p.m. – 1:30 p.m.:** Lunch at Hickory Pavilion provided by Nature Conservancy
**2:45 p.m.:** Meet bus to depart for Purdue Memorial Union Club Hotel on Grant street
**3:00 p.m.:** Depart Shades State Park
**5:00 p.m. – 6:00 p.m.:** Cocktail hour (drink ticket provided) East and West Faculty Lounge, 2nd Floor, Purdue Memorial Union
**6:00 p.m. – 7:00 p.m.:** Banquet dinner East and West Faculty Lounge, 2nd Floor, Purdue Memorial Union
**7:00 p.m. – 9:45 p.m.:** Desserts, speakers, awards and door prizes
**9:45 p.m. – 10:00 p.m.:** Closing remarks

# *Conference Program*
# *Wednesday, 29 July 2015*
# *Stewart Center Purdue University*

## STUDENT-ORGANIZED SYMPOSIUM:
### A Chemical Conga: Lepidoptera and Host-plant Secondary Chemistry

**Organizers:** Timothy Anderson, Julia Snyder and Elena Ortiz
**Moderators:** Timothy Anderson and Elena Ortiz

**8:00 a.m. – 8:15 a.m.:** Announcements and welcoming remarks

**8:15 a.m. – 8:30 a.m.:** Introduction to student-organized symposium **"*A chemical conga: Lepidoptera and host-plant secondary chemistry*"**

**8:30 a.m. – 9:00 a.m.** – Angela M. Smilanich, Tara C. Langus "The effects of plant chemistry, egg microbes, and a densovirus on the immune response of a specialist caterpillars" – abstract 001

**9:00 a.m. – 9:30 a.m.** – Jennifer M. Zaspel "Chemical dependency and toxic relationships in tiger moths" – abstract 002

**9:30 a.m. – 10:00 a.m.** – Mirian M. Hay-Roe **"**Advances in the chemical ecology of *Heliconius erato*" – abstract 003

**10:00 a.m. – 10:30 a.m.** – BREAK

**10:30 a.m. – 11:00 a.m.** – Evan Lampert "Does catalpol sequestration function as a chemical defense in the catalpa sphinx caterpillar?" – abstract 004

**11:00 a.m. – 11:30 a.m.** – Peri Mason "You are *where* you eat: Geographic variation in iridoid glycoside sequestration in the Baltimore Checkerspot" – abstract 005

**11:30 a.m. – 12:00 p.m.** – James Mallet "Gene flow between *Heliconius* species: how butterflies mess with our species concept" – abstract 006

**12:00 p.m. – 1:30 p.m.** – LUNCH (on your own)

# CONTRIBUTED PAPERS

**Moderators:** Megan McCarty and Julia Snyder

**1:30 p.m. – 1:50 p.m.** – Alberto Zilli "Italy, a Lepidopterological profile" – abstract 007

**1:50 p.m. – 2:10 p.m.** – Jean-François Landry, Marilyn Light, Michael MacConaill "*Paralobesia cypripediana* (Tortricidae): a stealthy micromoth feeding on *Cypripedium reginae* (Orchidaceae)" – abstract 008

**2:10 p.m. – 2:30 p.m.** – Todd M. Gilligan, Donald J. Wright "*Eucosma* Hübner of the Contiguous United States and Canada (Lepidoptera: Tortricidae: Eucosmini)" – abstract 009

**2:30 p.m. – 2:50 p.m.** – Matthew S. Lehnert, Eric Brown, Margaret P. Lehnert, Patrick D. Gerard, Huan Yan, Chanjoong Kim "The Golden Ratio in proboscis coiling patterns of sap feeding butterflies" – abstract 010

**2:50 p.m. – 3:10 p.m.** – Maria Heikkilä, Marko Mutanen, Niklas Wahlberg, Pasi Sihvonen, Lauri Kaila "Elusive ditrysian phylogeny – a report on combining systematized morphology with molecular data" – abstract 011

**3:10 p.m. – 3:30 p.m.** – Qian Cong, Dominika Borek, Zbyszek Otwinowski, Nick V. Grishin "Eastern tiger swallowtail genome reveals mechanisms for speciation and caterpillar chemical defense" – abstract 012

**3:10 p.m. – 3:30 p.m.** – Tom C. Velat "Population size and percent survival from egg to adult in response to rainfall intensity in the Baltimore checkerspot butterfly (*Euphydryas phaeton phaeton* Drury)" – abstract 013

**3:30 p.m. – 3:45 p.m.** – BREAK

**3:45 p.m. – 4:30 p.m.** – Keynote speaker I, Charlie Covell, "Evolution of the moth collection at the McGuire Center for Lepidoptera and Biodiversity, 2004 - 2015" – abstract 014

**4:30 p.m. – 5:15 p.m.:** Membership meeting

**6:30 p.m.:** Depart for black lighting at the Adam's Mill on the Wildcat Creek (Meet at Purdue Memorial Union Club Hotel)

**11:30 p.m.:** Return to Purdue Memorial Union Club Hotel on Grant street

## *Conference Program*
## *Thursday, 30 July 2015*
## *Stewart Center Purdue University*

# STUDENT ORAL PRESENTATIONS:

**Moderators:** Alberto Zilli and Delano Lewis

**8:00 a.m. – 8:15 a.m.:** Announcements and opening remarks

**8:15 a.m. – 8:35 a.m.** – Nicholas Homziak, Jesse Breinholt, Akito Kawahara "Out of the darkness: Understanding erebine phylogenetics with next generation sequencing" – abstract 015

**8:35 a.m. – 8:55 a.m.** – Valerie R. Kramer, Catherine P. Mulvane, Aubrey Brothers, Patrick D. Gerard, Matthew S. Lehnert "Allometry among proboscis structures in relation to fluid uptake abilities of Painted lady butterflies" – abstract 016

**8:55 a.m. – 9:15 a.m.** – Elena Ortiz-Acevedo, Marianne Espeland, Keith R. Willmott "Insights into the origin and evolution of preponine butterflies" – abstract 017

**9:15 a.m. – 9:35 a.m.** – Ashley L. Lash, Matthew S. Lehnert "Fluid uptake in butterflies with separated mouthparts" – abstract 018

**9:35 a.m. – 9:55 a.m.** – Timothy J. Anderson, David L. Wagner, Bruce R. Cooper, Megan McCarty, Jennifer M. Zaspel "HPLC-MS of lichen-derived metabolites in the life stages of *Crambidia cephalica* (Grote and Robinson) (Lepidoptera: Erebidae: Arctiinae: Lithosiini)" – abstract 019

**9:55 a.m. – 10:30 a.m.** – BREAK

**10:30 a.m. – 10:50 a.m.** – Kristen E. Reiter, Matthew S. Lehnert "Convergent evolution of a wettability dichotomy in butterfly and fly mouthparts" – abstract 020

**10:50 a.m. – 11:10 a.m.** – Megan McCarty, Timothy J. Anderson, Julia Snyder, Bruce R. Cooper, Jennifer M. Zaspel "Chemical ecology in arctiines: Metabolomic profiling in three unpalatable species (*Pyrrharctia isabella*, *Spilosoma virginica*, and *Cycnia tenera*) and their hosts" – abstract 021

**11:10 a.m. – 11:30 a.m.** – Brigette Zacharczenko, David Wagner "Who can you trust? The trouble with larval host records in *Acronicta* (and all Lepidoptera)" – abstract 022

**11:30 a.m. – 11:50 a.m.** – Andrew Bennett, Matthew S. Lehnert "Capillarity is an essential mechanism for liquid uptake from porous surfaces by fluid-feeding insects" – abstract 023

**11:50 a.m. – 12:00 p.m**. – Closing remarks

**12:00 p.m. – 1:30 p.m.** – LUNCH (on your own)

## CONTRIBUTED PAPERS

**Moderators:** Jacqueline Y. Miller and Chris Grinter

**1:30 p.m. – 2:00 p.m.** – Qian Cong, Nick V. Grishin "Solving taxonomic puzzles by DNA barcoding of 150-year-old type specimens"– abstract 024

**2:00 p.m. – 2:30 p.m.** – Mari Kekkonen "DNA Barcoding at the Family Level: Considering the Gelechioidea"– abstract 025

**2:30 p.m. – 3:00 p.m.** – Erik J. van Nieukerken, Camiel Doorenweerd, Marko Mutanen, Jean-François Landry, Jeremy Miller, Jeremy R. deWaard "A great inventory of the small: combining BOLD datamining and focused sampling hugely increases knowledge of taxonomy, biology, and distribution of leafmining pygmy moths (Lepidoptera: Nepticulidae)"– abstract 026

## POSTER SESSION 3:00 p.m. - 4:00 p.m.

Ice Cream Social (novelties provided by Leptraps, LLC)

**Vendors:**

**Leptraps, LLC:** http://www.leptraps.com/
**Kathy Wildman:** http://whatdidyoubringme.com/
**Buck Richardson:** www.leapfrogoz.com.au

D001 – Julia Snyder, Timothy J. Anderson, Jennifer M. Zaspel "Survey of secondary plant metabolites in tiger moths (Lepidoptera: Erebidae: Arctiinae)" (student poster)

D002 – Robert Behring, Matt Ginzel, Jennifer M. Zaspel "Distribution, ecology and adult feeding behavior in the Canadian owlet moth, *Calyptra canadensis* (Bethune, 1865)" (student poster)

D003 – Ryan A. St. Laurent, Jason J. Dombroskie "Revision of the genus *Menevia* Schaus, 1928 (Lepidoptera: Mimallonoidea: Mimallonidae) with descriptions of several new species"

D004 – Debbie L. Matthews, Jacqueline Y. Miller, Andrew D. Warren, James K. Toomey, Roger W. Portell, Terry A. Lott, Nick V. Grishin "Guantanamo blues: taking a closer look at *Cyclargus* (Lepidoptera: Lycaenidae) from Cuba"

D005 – Delano S. Lewis, Felix A. H. Sperling, Shinichi Nakaharaa, Adam M. Cotton, Akito Y. Kawaharaa, Fabien L. Condamine "Role of Caribbean Islands in the Diversification and Biogeography of Neotropical Heraclides Swallowtails"

**4:00 p.m. – 4:30 p.m.:** Keynote speaker II, Geoff Martin, "*iCollections project: the*

*digitisation of the British & Irish Lepidoptera collection at the Natural History Museum, London*" – abstract 027

**4:30 p.m. – 5:15 p.m.:** Business Meeting

**5:15 p.m. – 5:30 p.m.:** Closing remarks

## *Conference Program*
## *Friday, 31 July 2015*
## *Stewart Center Purdue University*

# CONTRIBUTED PAPERS:

**Moderators:** Crystal Purcell and Jennifer M. Zaspel

**8:00 a.m. – 8:15 a.m.:** Announcements and opening remarks

**8:15 a.m. – 8:45 a.m.** – James Adams "Digitization of Sphingids and Saturniids at the McGuire"– abstract 028

**8:45 a.m. – 9:15 a.m.** – Mirian M. Hay-Roe, Rodney N. Nagoshi, Robert L. Meagher "Effects of cyanogenic compounds on the host strains of the fall Armyworm (*Spodoptera frugiperda*)"– abstract 029

**9:15 a.m. – 9:45 a.m.** – Christi Jaeger, Richard L. Brown "Moth Photographers Group: recent developments and future undertakings" – abstract 030

**9:45 a.m. – 10:15 a.m.** – Kojiro Shiraiwa, Qian Cong, Nick V. Grishin "A new *Heraclides* swallowtail (Lepidoptera, Papilionidae) from North America is recognized by the pattern on its neck" – abstract 031

**10:15 a.m. – 10:30 a.m.** – BREAK

**10:30 a.m. – 11:00 a.m.** – Erik Runquist "Saving Endangered Prairie Butterflies"– abstract 032

**11:00 a.m. – 11:30 a.m.** – Vazrick Nazari "Butterflies in Rock Art" –abstract 033

**11:30 a.m. – 12:00 p.m.** – Chris Grinter "The Past and Future of Lepidoptera Collections at the Illinois Natural History Survey"– abstract 034

**12:00 p.m. – 12:15 p.m**. – Closing remarks

**12:15 p.m. – 1:30 p.m.** – LUNCH (on your own)

**1:30 p.m. – 2:00 p.m.:** Group photograph (please meet at STEW for instructions 302-306)

**2:00 p.m. – 3:00 p.m.:** Keynote Speaker III, John Shuey, "An Overview of Indiana Habitats and Conservation" – abstract 035

**3:00 p.m. – 3:15 p.m.:** Break

**3:15 p.m. – 3:30 p.m.:** Akito Y. Kawahara, David Lohman, Rob Guralnick, Naomi E. Pierce "ButterflyNet: An integrative framework for comparative biology" – abstract 036

**3:30 p.m. – 3:45 p.m.** Neil S. Cobb and LepNet Consortium "Lepidoptera of North America Network: Documenting Diversity in the Largest Clade of Herbivores" – abstract 037

**4:00 p.m. – 5:00 p.m.:** Poster removal

**5:30 p.m.:** Meet bus to depart for West Lafayette Country Club (WLCC) BBQ and live jazz music ***Danny Weiss Trio*** (bus will depart outside of the Purdue Memorial Union Club Hotel on Grant street)

**5:45 p.m.:** Depart for West Lafayette Country Club

**6:00 p.m.:** West Lafayette Country Club Reception

**7:00 p.m.:** West Lafayette Country Club Dinner

**8:45 p.m.:** Depart for Purdue Memorial Union Club Hotel

# *Conference Program*
# *Saturday, 1 August 2015*
# *Group Excursion: Indiana Shades State Park*

**7:45 a.m.:** Meet for group excursion to Shades State Park (bus will depart outside of the Purdue Memorial Union Club Hotel on Grant street)

**8:00 a.m.:** Depart for group excursion, transportation provided by Purdue Entomology

**9:00 a.m.:** Arrive at Shades State Park for observing, photographing, etc.

**10:00 a.m. – 11:45 a.m.:** Limited collecting: Woodlands/airstrip area (group 1)

**10:00 a.m. – 11:45 a.m.:** Hike to Devil's Punchbowl (group 2)

**12:00 p.m. – 1:30 p.m.:** Lunch at Hickory Pavilion provided by Nature Conservancy

**1:30 p.m. – 2:30 p.m.:** Limited collecting: Woodlands/airstrip area (group 2)

**1:30 p.m. – 2:30 p.m.:** Hike to Devil's Punchbowl (group 1)

**2:45 p.m.:** Meet bus to depart for Purdue Memorial Union Club Hotel on Grant street

**3:00 p.m.:** Depart Shades State Park

**4:00 p.m.:** Return to Purdue Memorial Union Club Hotel on Grant street

**5:00 p.m. – 6:00 p.m.:** Cocktail hour (drink ticket provided) East and West Faculty Lounge, 2nd Floor, Purdue Memorial Union

**6:00 p.m. – 7:00 p.m.:** Banquet dinner East and West Faculty Lounge, 2nd Floor, Purdue Memorial Union

**7:00 p.m. – 9:45 p.m.:** Desserts, speakers, awards and door prizes
The future of the Lepidopterists' Society – Todd Gilligan
Awards – Todd Gilligan & Charlie Covell
Alexander B. Klots Award
Harry K. Clench Award
Bryant Mather [Travel] Award
2016 LepSoc meeting in Whitehorse, Yukon – Crispin Guppy
The Karl Jordan Medal – presentation by Jackie Miller and recipient Ted Edwards
Door prizes – Charlie Covell

**9:45 p.m. – 10:00 p.m.:** Closing remarks

# ABSTRACTS

**001 -** Symposium Speaker
**AUTHOR(S):** Angela M. Smilanich, Tara C. Langus
**CONTACT INFORMATION:** 1664 N. Virginia Street, Reno, NV 89557
Department of Biology, University of Nevada, Reno, Phone: 775- 784-1302, Email: asmilanich@unr.edu
**TITLE:** The effects of plant chemistry, egg microbes, and a densovirus on the immune response of a specialist caterpillars
**ABSTRACT:** Understanding sources of variation in the immune response is an important goal in the emerging field of ecoimmunology. In this study, we asked whether sequestration of a plant defense compound affects caterpillars' ability to resist a densovirus. Caterpillars were exposed to the virus, then fed either a plant with high or low concentrations of secondary metabolites. In addition, a subset of eggs were surface sterilized to investigate whether microbes on the egg's surface contributed to viral resistance. We found that individuals exposed to the virus had significantly lower PO activity compared to the unexposed individuals. However, there was no effect of diet on PO activity. Survival was significantly higher in individuals feeding on host plants with high concentrations of secondary metabolites. Individuals that were washed as eggs and exposed to the virus had higher mortality than individuals that were exposed, but not washed. In summary, these data show that plant chemistry plays a role in resistance to viral enemies. The effect of chemistry, however, was not directly on the immune response itself, but directly on the virus, possibly interfering with the ability of the virus to successfully infect the caterpillars.

**002 -** Symposium Speaker
**AUTHOR(S):** Jennifer M. Zaspel
**CONTACT INFORMATION:** Department of Entomology, Purdue University, 901 W. State Street, W. Lafayette, IN 47097, Phone: 765-494-4599, Email: jzaspel@purdue.edu
**TITLE:** Chemical dependency and toxic relationships in tiger moths
**ABSTRACT:** Tiger moths are an ideal and charismatic radiation for examining the evolution of complex plant-insect associations and evolution of defense. Both brightly colored and distasteful to their predators, tiger moth species derive their unpalatable nature from a close association with plants and fungi with poisonous secondary chemicals. Some secondary plant chemicals, such as pyrrolizidine alkaloids (PAs), are demonstrated to induce feeding in tiger moths, and are incorporated into courtship behaviors as short-range pheromones. Less understood is the role of lichen-derived phenolics and other compounds implicated in the chemoecology of tiger moths. Analysis of chemical profiles using exemplar species in a phylogenomic context elucidates origins of chemical sequestration and host associations within the lineage.

**003 -** Symposium Speaker
**AUTHOR(S):** Mirian M. Hay-Roe
**CONTACT INFORMATION:** 1700 SW. 23rd Drive, Gainesville, FL 32608, USDA, ARS, CMAVE, Behavior and Biocontrol Unit, Phone: 352-374-5988, Email: mmhr@ufl.edu

**TITLE:** Advances in the chemical ecology of *Heliconius erato*
**ABSTRACT:** *Heliconius erato*, a neotropical butterfly known to specialize in larval feeding on cyanide-producing Passiflora plants, has evolved different strategies for dealing with cyanogenic compounds. It is known, that *H. erato* synthesizes de novo aliphatic cyanogenic glycosides, however recent biochemical studies indicates that the larvae of this species also sequesters both simple and complex cyclopentenoid glycosides from their host plants. In addition, during the larval stage *H. erato* metabolized the complex cyclopentenoid glycosides into simple cyclopentenoid glycosides. Analysis of amino acids in the adults revealed that these butterflies are storing not only cyanogenic compounds for defense, but also essential amino acids from metabolized cyclopentenoids gathered during the larval stage.

**004 -** Symposium Speaker
**AUTHOR(S):** Evan Lampert
**CONTACT INFORMATION:** 3820 Mundy Mill Road, Oakwood GA 30566, Biology Department, University of North Georgia, Phone: 678-717-3804, Email: evan.lampert@ung.edu
**TITLE:** Does catalpol sequestration function as a chemical defense in the catalpa sphinx caterpillar?
**ABSTRACT:** Catalpol and other iridoid glycosides are sequestered by several species of lepidopterans, and high concentrations of sequestered iridoid glycosides inside lepidopterans have been associated with reduced predation rates and performance of their predators. Larvae of the catalpa sphinx, *Ceratomia catalpae*, sequester high concentrations of catalpol obtained from their *Catalpa* spp. host plants. Although the gregarious parasitoid *Cotesia congregata* is a major natural enemy of catalpa sphinx, catalpol sequestration is not associated with reduced *Cotesia congregata* parasitism rate or performance. Catalpol sequestration does influence the selection and rejection behavior of several groups of potential invertebrate predators of catalpa sphinx larvae. The varying responses of different types of natural enemies to sequestered plant compounds suggests that chemical defense can be context-specific. Natural enemies that are not deterred by plant compounds may thus have an adaptive advantage when attacking prey chemically defended against other natural enemies.

**005 -** Symposium Speaker
**AUTHOR(S):** Peri Mason
**CONTACT INFORMATION:** 1800 Colorado Avenue, Boulder CO 80309, Ecology & Evolutionary Biology, University of Colorado Boulder, Phone: 303-492-1535, Email: peri.mason@colorado.edu
**TITLE:** You are *where* you eat: Geographic variation in iridoid glycoside sequestration in the Baltimore Checkerspot
**ABSTRACT:** Both inter- and intraspecific variation in the defensive chemistry of plants can affect the amounts of chemicals available to herbivores that sequester them for their own defense. Geographic variation in host plant use, and in the degree to which plants of a given species invest in chemical defense can, therefore, lead to geographic mosaics in palatability of sequestering species. In this study we asked whether there is population-level variation in concentrations of iridoid glycosides sequestered by the specialist

butterfly, *Euphydryas phaeton*, and if so, whether it can be explained by the identities of host plants used, and/or latitude. We collected butterflies from 26 eastern North American populations that varied in host plant use, including populations using the introduced species, *Plantago lanceolata*. We found that butterflies from different populations varied significantly in their iridoid glycoside content, and that this variation could be attributed both to host plant use, and to latitude. Butterflies from populations using *P. lanceolata* did not differ in the concentrations of total iridoids that they contained, relative to the primary host of *E. phaeton*, *Chelone glabra*. However, butterflies from *P. lanceolata* and *C. glabra* populations did differ in the ratio of the iridoids, aucubin and catalpol, that they harbored. Possible consequences of use of the non-native plant for immunological defense are discussed. The finding that sequestration was higher in lower-latitude populations is consistent with the notion that herbivore pressure causes plants at lower latitudes to invest more heavily in chemical defense, and that sequestering herbivores may thereby attain greater toxicity than their northern counterparts.

**006 -** Symposium Speaker
**AUTHOR(S):** James Mallet
**CONTACT INFORMATION:** 16 Divinity Avenue, Cambridge, MA 02138, Department of Organismic and Evolutionary Biology, Harvard University, Phone: 617-496-5350, Email: jmallet@oeb.harvard.edu
**TITLE:** Gene flow between *Heliconius* species: how butterflies mess with our species concept
**ABSTRACT:** It is a seductive idea that species are independent evolutionary units. Most individuals do not hybridize with members of other species, but occasional hybridization could allow the transfer of significant variation in many species. Brightly-coloured *Heliconius* butterflies engage in Müllerian mimicry of other species. Most of this mimicry is due to adaptive reconstruction of similar patterns, but we've long suspected that colour patterns are sometimes exchanged among the more closely related species that hybridize occasionally in the wild. We have recently demonstrated gene flow on a genome-wide basis among such species, especially at regions involved in mimicry. In addition, we have unpublished data showing that admixture may affect up to around 98% of the genome in one pair of broadly sympatric species in the Amazon.

**007 –** Contributed Paper
**AUTHOR(S):** Alberto Zilli
**CONTACT INFORMATION:** Natural History Museum, Life Sciences, Cromwell Road, SW7 5BD London, UK, E-mail: a.zilli@nhm.ac.uk
**TITLE:** Italy, a Lepidopterological profile
**ABSTRACT:** Despite the fact it is a comparatively small country (116,348 sq mi), Italy hosts a very rich (5,000+ species) and locally heterogeneous Lepidopterological fauna. The position of its peninsula as a bridge between continental Europe and Africa with the Apennine chain acting like a backbone allows the biomes of the temperate deciduous forest and evergreen Mediterranean belt to remain in contact virtually its entire length. Furthermore, the two largest Mediterranean islands (Sicily and Sardinia) add relic populations and unique endemics to the country records. The main eco-geographic

determinants accounting for such diversity will be reviewed. In addition to present-day ecological factors, also complex range dynamics and faunal exchanges with nearby areas, which developed during the Pleistocene, contributed in shaping current Lepidoptera diversity in Italy. This has produced a number of biogeographical oddities and interesting evolutionary phenomena, which will also be discussed.

**008 –** Contributed Paper
**AUTHOR(S):** Jean-François Landry, Marilyn Light, Michael MacConaill
**CONTACT INFORMATION:** Canadian National Collection of Insects, Arachnids, and Nematodes, 960 Carling Avenue, Ottawa, Ontario K1A 0C6, Phone: *613-759-1825, Email: Jean-Francois.Landry@AGR.GC.CA*
**TITLE:** *Paralobesia cypripediana* (Tortricidae): a stealthy micromoth feeding on *Cypripedium reginae* (Orchidaceae)
**ABSTRACT:** *Paralobesia cypripediana* is a rare tortricid whose larvae feed on the Showy Ladyslipper, *Cypripedium reginae*, a threatened orchid. Larvae appear to be strictly monophagous on a single species of orchid and thus has few and highly localized populations where the orchid host is in sufficient abundance. Adults were successfully reared after 5 years of trials. Details of its life history will be presented. DNA barcoding showed that occurrence of the species has been overestimated and that most historical records and several barcode records were based on misidentifications of other *Paralobesia* species. Barcoding the related orchid-feeding *cypripediana* had a cascading effect for rectifying the identification of 135 *Paralobesia* barcode records in BOLD, including the correct association of the grape berry moth (*Paralobesia viteana*) barcodes which had previously remained undetermined or misidentified.

**009 –** Contributed Paper
**AUTHOR(S):** Todd M. Gilligan, Donald J. Wright
**CONTACT INFORMATION:** Colorado State University, BSPM, 1177 Campus Delivery, Fort Collins, CO 80523, Email: tgilliga@gmail.com
**TITLE:** *Eucosma* Hübner of the Contiguous United States and Canada (Lepidoptera: Tortricidae: Eucosmini)
**ABSTRACT:** *Eucosma* Hübner is one of the largest genera in the Tortricidae, with more than 230 described species. It achieves its greatest species richness in the Nearctic, where members of the genus can be found in nearly every habitat, from the dunes of the Gulf Coast to the barren summits of the Rocky Mountains. Here we detail the first comprehensive treatment of North American *Eucosma* to be published in more than 90 years. We provide an overview of the genus and the 133 species present in the contiguous United States and Canada, present recent taxonomic changes, and discuss several unresolved species complexes.

**010 –** Contributed Paper
**AUTHOR(S):** Matthew S. Lehnert, Eric Brown, Margaret P. Lehnert, Patrick D. Gerard, Huan Yan, Chanjoong Kim
**CONTACT INFORMATION:** Department of Biological Sciences, Kent State University at Stark, 6000 Frank Ave. NW, North Canton, OH, Phone: 330-244-3349, Email: mlehner1@kent.edu

**TITLE:** The Golden Ratio in proboscis coiling patterns of sap feeding butterflies
**ABSTRACT:** The Golden Ratio, which is often depicted as a spiral, is found in art, architecture and nature. An irrational number, the Golden Ratio is found when two parts of the compounding whole have a ratio equal to that of the ratio between the larger of the two parts to the whole. The purpose of this study was to determine if the coiling patterns of butterfly proboscises matched the Golden Ratio. We used a high-speed camera to record proboscis-coiling patterns of five butterfly species. A frame from the video was measured to determine its closeness of fit to the Golden Ratio. We found that butterflies with sap feeding habits closely fit the Golden Ratio, whereas proboscis configurations of nectar feeders did not. We suggest that differences in coiling configurations could be due to variations in proboscis musculature, which might have an adaptive role that relates to the substrate architecture from which butterflies feed.

**011 –** Contributed Paper
**AUTHOR(S):** Maria Heikkilä, Marko Mutanen, Niklas Wahlberg, Pasi Sihvonen, Lauri Kaila
**CONTACT INFORMATION:** heikkilam@si.edu
**TITLE:** Elusive ditrysian phylogeny – a report on combining systematized morphology with molecular data
**ABSTRACT:** The evolutionary relationships between ditrysian superfamilies (ca. 99% of all moths and butterflies) are still unresolved. To complement recent research based on DNA and transcriptomic data, we analyze the most comprehensive morphological data set on Ditrysia to date combined with DNA data from 8 gene regions (473 exemplar taxa in total). The results suggest that in Ditrysia morphological characters are phylogenetically informative in resolving superfamily and family level relationships, but characters serving as evidence of relatedness of larger assemblages are few. We present morphological evidence supporting affinities between clades. Adding morphological data to the analyses also helps to find a more stable position for some "rogue" taxa that are unstable in analyses based on genetic data only. The large morphological data set provides information on the diversity and distribution of morphological traits and can be used in future research on the evolutionary history of Ditrysia.

**012 –** Contributed Paper
**AUTHOR(S):** Qian Cong, Dominika Borek, Zbyszek Otwinowski, Nick V. Grishin
**CONTACT INFORMATION:** UT Southwestern, 5323 Harry Hines Blvd., Dallas, TX 75390-9050, Phone: 214-645-5952, Email: grishin@chop.swmed.edu
**TITLE:** Eastern tiger swallowtail genome reveals mechanisms for speciation and caterpillar chemical defense
**ABSTRACT:** We present the 376 Mb genome sequence of *Papilio glaucus* (Pgl), the first sequenced genome from the Papilionidae family. We obtained the genome from a wild-caught specimen using a cost-effective strategy that overcomes the high (2%) heterozygosity problem. Comparative analyses suggest the molecular bases of various phenotypic traits, including terpene production in the Papilionidae-specific organ, osmeterium. Comparison of Pgl and *Papilio canadensis* transcriptomes reveals mutation hotspots (4% genes) associated with their divergence: four key circadian clock proteins are enriched in inter-species mutations and likely responsible for the difference in pupal

diapause. Finally, the Pgl genome confirms *Papilio appalachiensis* as a hybrid of Pgl and Pca, but suggests it inherited 3/4 of its genes from Pca.

**013 –** Contributed Paper
**AUTHOR(S):** Tom C. Velat
**CONTACT INFORMATION:** P.O. Box 5000, Wheaton, Illinois 60189-5000, Phone: 630-871-6426, Email: tvelat@dupageforest.org
**TITLE:** Population size and percent survival from egg to adult in response to rainfall intensity in the Baltimore checkerspot butterfly (*Euphydryas phaeton phaeton* Drury)
**ABSTRACT:** Increases in rainfall intensity in the U.S. over the past 50 years have been linked to greater water-holding capacity in the atmosphere due in part to climate change. I examined the effects of rainfall intensity on population size of the Baltimore Checkerspot using mark-recapture data from 2010 - 2015. I calculated rainfall intensity using hourly rainfall data from NOAA and a field-deployed rain gauge. I applied the POPAN extension in Program Mark to analyze mark-recapture data and explore differences in monthly rainfall intensity compared to various population metrics. Mid-summer rainfall intensity in the prior season was positively correlated with % survival of egg to adult in the subsequent season. Although not significant, spring rainfall data showed a negative correlation with population size in the same season. I recommend further study of rainfall intensity as a metric to guide management decisions for this species in the Midwestern U.S.

**014 –** Keynote Speaker
**AUTHOR(S):** Charlie Covell
**CONTACT INFORMATION:** McGuire Center for Lepidoptera & Biodiversity Florida Museum of Natural History, Gainesville, FL 32611, Email: ccovell@flmnh.ufl.edu
**TITLE:** Evolution of the moth collection at the McGuire Center for Lepidoptera and Biodiversity, 2004 - 2015
**ABSTRACT:** Since opening in 2004, the McGuire Center has grown steadily by the movement of the DPI Lepidoptera collection once curated by John Heppner, and by the acquisition of several major moth collections. Some of these were assembled by well-known citizen scientists such as the late Richard Heitzman, Ron Leuschner, Linwood Dow, and Irving Finkelstein, as well as others. This presentation focuses on the extent of these collections and the status of their assimilation into the McGuire Center collections. Workers are encouraged to make use of these remarkable resources in their research.

**015** – Student Oral Presentation
**AUTHOR(S):** Nicholas Homziak, Jesse Breinholt, Akito Kawahara
**CONTACT INFORMATION:** McGuire Center for Lepidoptera & Biodiversity Florida Museum of Natural History, Gainesville, FL 32611, Email: nhomziak@ufl.edu
**TITLE:** Out of the Darkness: Understanding Erebine Phylogenetics with Next Generation Sequencing
**ABSTRACT:** The Erebidae is one of the most speciose superfamilies of the Lepidoptera, exhibiting a fascinating diversity of forms and behavior. The family is currently divided into 18 moderately to strongly supported subfamilies based on the results of molecular studies. Of these subfamilies, the Erebinae is particularly diverse and reaches its greatest

richness in tropical regions. Despite these recent molecular studies, relationships below the subfamily level remain poorly resolved. This study makes use of anchored hybrid enrichment to obtain large quantities of unlinked genes for phylogenetic analysis, based on global sampling of erebine moths. The taxonomic history of the Erebinae is reviewed, and preliminary results are discussed.

**016** – Student Oral Presentation
**AUTHOR(S):** Valerie R. Kramer, Catherine P. Mulvane, Aubrey Brothers, Patrick D. Gerard, Matthew S. Lehnert
**CONTACT INFORMATION:** Department of Biological Sciences, Kent State University at Stark, 6000 Frank Ave. NW, North Canton, OH 44720, Email: mlehner1@kent.edu
**TITLE:** Allometry among proboscis structures in relation to fluid uptake abilities of Painted lady butterflies
**ABSTRACT:** The butterfly proboscis is composed of structures that act as a functional unit for fluid uptake. The purpose of our study was to determine if the structural configurations of proboscises and associated fluid uptake rates vary among Painted lady butterflies (*Vanessa cardui*) of different body masses. We measured six proboscis characters and used the allometric growth equation with log10-transformed data and linear regression analysis to determine patterns of allometry. In general, there was negative allometry among measured characters when proboscis length and butterfly mass were the independent variables. Fluid uptake rates, however, indicated an isometric relationship to measured characters. Our study indicated that proboscis architecture does not change proportionally in relation to changes in butterfly mass, which suggests intense selection pressures to maintain a particular proboscis configuration.

**017** – Student Oral Presentation
**AUTHOR(S):** Elena Ortiz-Acevedo, Marianne Espeland, Keith R. Willmott
**CONTACT INFORMATION:** McGuire Center for Lepidoptera & Biodiversity Florida Museum of Natural History, Gainesville, FL 32611, Email: eortiz@ufl.edu, e.ortiz.acevedo@gmail.com
**TITLE:** Insights into the origin and evolution of preponine butterflies
**ABSTRACT:** The nymphalid butterfly tribe Preponini includes some of the most spectacular butterflies in the Neotropics. The taxonomy of the group remained stable for many years until recent a phylogenetic hypothesis suggested major changes. In this study we complement the aforementioned hypothesis with 38 samples and three nuclear markers for a total of 87 preponine representatives. We used Maximum Likelihood and Bayesian Inference to reconstruct the phylogenetic relationships in order to (i) explore in detail the species level issues and (ii) investigate the evolution of the tribe from a geographical and temporal perspective. Broadening the taxonomical representation, by including specimens from distant geographical locations and different coloration patterns, allowed us to uncover unknown phylogenetic diversity. However, a more detailed study is still needed. Additionally, our preliminary biogeographical analyses suggest that the tribe most likely originated in the North Central Andes or the Amazon basin, with subsequent dispersal to Central America and southern South America.

**018** – Student Oral Presentation
**AUTHOR(S):** Ashley L. Lash, Matthew S. Lehnert
**CONTACT INFORMATION:** Department of Biological Sciences, Kent State University at Stark, 6000 Frank Ave. NW, North Canton, OH 44720, Email: mlehner1@kent.edu
**TITLE:** Fluid uptake in butterflies with separated mouthparts
**ABSTRACT:** Most Lepidoptera use a proboscis that acts as a conduit for transporting fluids from pools and liquid films to the gut. Fluid uptake mechanisms are often related to a drinking straw, relying on the sucking pump to induce fluid rise. Recent studies, however, indicate that capillarity and wettability dynamics are essential for feeding. The purpose of this study was to determine if the sucking pump is necessary for fluid uptake and feeding. We used four feeding treatments with Painted lady butterflies (*Vanessa cardui*) to test the hypothesis that fluid rise is independent of the sucking pump. Butterflies in each treatment had the proboscis split for different lengths and were fed a 20% sucrose solution with green food coloring. Butterflies were subsequently dissected and inspected for the presence of food coloring. Our results suggest that butterflies can feed with split proboscises; however, the amount of fluids in the crops differed among butterflies of different feeding treatments.

**019** – Student Oral Presentation
**AUTHOR(S):** Timothy J. Anderson, David L. Wagner, Bruce R. Cooper, Megan McCarty, Jennifer M. Zaspel
**CONTACT INFORMATION:** Department of Entomology, Purdue University, 901 W. State Street, West Lafayette, IN 47907, Email: ander472@purdue.edu
**TITLE:** HPLC-MS of lichen-derived metabolites in the life stages of *Crambidia cephalica* (Grote and Robinson) (Lepidoptera: Erebidae: Arctiinae: Lithosiini)
**ABSTRACT:** Tiger moths (Lepidoptera: Erebidae: Arctiinae) are an ideal study system for understanding plant-insect interactions, and the evolution of antipredatory behaviors, because they are known to sequester plant toxins (secondary metabolites). Lithosiines (Arctiinae: Lithosiini), commonly called lichen moths due to their larval feeding behavior, represent the basal tribe of arctiines and some are known to sequester secondary metabolites. Yet, we lack a basic understanding on the extent of lichenivory among lithosiines and dynamics of chemical sequestration among life stages. Dynamics of chemical sequestration for the lichen moth *Crambidia cephalica* (Grote and Robinson) were investigated by testing that lichen-derived metabolites are unequally distributed among life stages. *Crambidia cephalica* was reared on *Physcia* (Schreber) Michaux, and examined using high performance liquid chromatography-mass spectrometry (HPLC-MS). Results indicated that several putative lichen-derived metabolites were detected among the life stages of *C. cephalica*. These results provide evidence that there are multiple lichen-derived metabolites sequestered by *C. cephalica*, and that some metabolites were retained through to adulthood while others were lost after the larval or pupal stage. The presence of lichen-derived metabolites in discrete life stages may indicate functional properties of the metabolites for *C. cephalica* with regards to chemical protection from antagonists and other physiological processes.

**020** – Student Oral Presentation

**AUTHOR(S):** Kristen E. Reiter, Matthew S. Lehnert
**CONTACT INFORMATION:** Department of Biological Sciences, Kent State University at Stark, 6000 Frank Ave. NW, North Canton, OH 44720, Email: mlehner1@kent.edu
**TITLE:** Convergent evolution of a wettability dichotomy in butterfly and fly mouthparts
**ABSTRACT:** Lepidoptera and Diptera (flies) independently evolved mouthparts that are modified for obtaining fluids, i.e., an adaptation not shared by their common ancestor approximately 260-280 mya. Although the feeding apparatuses of Diptera and Lepidoptera are composed of different, modified mouthparts, both groups share a common selection pressure of acquiring trace amounts of fluids from flowers and other wetted surfaces. Using contact angle measurements acquired with a capillary rise technique, the lepidopteran proboscis was previously shown to have an overall hydrophobic proximate region and a hydrophilic distal region. We employed a similar technique here to study the proboscises of three species of flies and found that they too possess a functionally-defined drinking and nondrinking region. We suspect that the hydrophobic nondrinking region has self-cleaning abilities and channels fluids to the hydrophilic regions for fluid uptake.

**021** – Student Oral Presentation
**AUTHOR(S):** Megan McCarty, Timothy J. Anderson, Jennifer M. Zaspel
**CONTACT INFORMATION:** Department of Entomology, Purdue University, 901 W. State Street, West Lafayette, IN 47907, Email: mccart31@purdue.edu
**TITLE:** Chemical ecology in arctiines: metabolomic profiling in three unpalatable species (*Pyrrharctia isabella*, *Spilosoma virginica*, and *Cycnia tenera*) and their hosts
**ABSTRACT:** Chemical ecology, the study of how organisms interact with one another through chemicals, is thought to be the driving force behind the evolution of insect-plant relationships. Sequestration of chemical compounds from food plants is one aspect of chemical ecology that has been well studied in the arctiine moths (Lepidoptera: Erebidae: Arctiinae). Many of these moths sequester pyrrolizidine alkaloids (PAs) at various life stages and use them for defense, pheromone production, and coremata development. In our study, three unpalatable species (*Pyrrharctia isabella*, *Spilosoma virginica*, and *Cycnia tenera*) were collected as eggs from wild females and reared to various stages for study. Metabolomic profiles were generated for these species as well as the host plants on which they were reared. Results of the data analysis will be discussed in the context of chemical communication and tiger moth evolutionary history.

**022** – Student Oral Presentation
**AUTHOR(S):** Brigette Zacharczenko, David Wagner
**CONTACT INFORMATION:** 50B Crystal Lane, Storrs CT 06268, Email: brigette.zacharczenko@uconn.edu
**TITLE:** Who can you trust? The trouble with larval host records in *Acronicta* (and all Lepidoptera)
**ABSTRACT:** Correct larval host records are vital for research in Lepidoptera: proper plants are essential for keeping experimental insects alive, identifying new species, and

for making ecological inferences. Incorrect records could result in dead larvae, off-base ecological conclusions, and even the implementation of misguided conservation policies. While it is tempting to take host lists from websites and books at face value, due diligence is required to evaluate the trustworthiness of each source. The main goal of this project is to examine the relationships between phylogeny, morphology, and diet breadth of *Acronicta* caterpillars. Quantifying diet breadth was hypothesized to be the "easy" part – which proved to be false. Here I present my attempts to tease reality from the glut of *Acronicta* host records from the late 1800s until present day. Misidentified larvae, misidentified plants, mis-read records, and bad taxonomy abound – in addition to hidden gems of primary sources. This portion of the project resulted in a dataset reasonably approximating reality, and will hopefully provide methodological help to other projects concerning diet breadth.

**023** – Student Oral Presentation
**AUTHOR(S):** Andrew Bennett, Matthew S. Lehnert
**CONTACT INFORMATION:** Department of Biological Sciences, Kent State University at Stark, 6000 Frank Ave. NW, North Canton, OH 44720, Email: mlehner1@kent.edu
**TITLE:** Capillarity is an essential mechanism for liquid uptake from porous surfaces by fluid-feeding insects
**ABSTRACT:** Lepidoptera and Diptera (flies) represent approximately 70% of all fluid-feeding insects. Both groups face the common selective pressure of acquiring fluids confined inside pores, which cannot be acquired through suction alone; therefore, we hypothesized that capillarity is initially employed for fluid uptake. We used the limiting-pore size hypothesis, which assumes that fluid uptake can occur if the radius of the pore sizes ≥ the radius of the food canal of the mouthparts. We fed four butterflies species and two fly species a mixture of a 20% sucrose solution with fluorescent, magnetic nanoparticles from filter papers with specified pore sizes. Insects were dissected, and a magnet was waved by the crop to visualize nanoparticle movement. As predicted, our results indicated a trend where butterflies with food canals of smaller radii fed from pores of smaller sizes. Flies, successfully fed from all pore sizes, probably due to a multi-channel hierarchy system of small conduits.

**024** – Contributed Paper
**AUTHOR(S):** Qian Cong, Nick V. Grishin
**CONTACT INFORMATION:** UT Southwestern, 5323 Harry Hines Blvd., Dallas, TX 75390-9050, Phone: 214-645-5952, Email: grishin@chop.swmed.edu
**TITLE:** Solving taxonomic puzzles by DNA barcoding of 150-year-old type specimens
**ABSTRACT:** The primary type specimens are frequently damaged: lost abdomens and other body parts essential for identification obscure their identity. Moreover, recent advances in molecular techniques uncover cryptic diversity in many Lepidoptera groups, and association of type specimens (and thus names) with these groups is exceedingly challenging. We are able to consistently obtain full-length COI mitochondrial DNA barcode sequences from 150-year-old primary type specimens of Lepidoptera preserved in collections world-wide (USA, UK, Germany). These sequences combined with morphological evidence allow us to associate primary type specimens with recently

collected specimens solving a number of taxonomic puzzles. Examples to show: *Hermeuptychia* (Nymphalidae), *Venada* (Hesperiidae), and *Dasylophia* (Notodontidae), among many others.

**025** – Contributed Paper
**AUTHOR(S):** Mari Kekkonen
**CONTACT INFORMATION:** Biodiversity Institute of Ontario, Phone: 519-824-4120 ext.55672, Email: kekkonen@uoguelph.ca
**TITLE:** DNA Barcoding at the Family Level: Considering the Gelechioidea
**ABSTRACT:** Although DNA barcoding is mainly a tool for specimen identification, it has increasingly been employed for species discovery and delineation. Several bio-assessment programs are now producing large numbers of barcodes that have been assigned to putative species through the Barcode Index Number (BIN) system on BOLD. Many of these BINs are currently only assigned to an order, but the capacity to automatically generate a family-level assignment for these taxa would greatly aid subsequent taxonomic work on them.

The Gelechioidea is one of the most diverse lepidopteran groups, but it is also one of the least studied. Even family-level assignment of gelechioids can be challenging due to their diversity, small size and the lack of external characters. My presentation will consider the monophyly of the 16 gelechioid families sensu Heikkilä et al. (2014) on DNA barcode gene trees. In addition, I will discuss the opportunities and challenges of family-level barcoding from a wider perspective.

**026** – Contributed Paper
**AUTHOR(S):** Erik J. van Nieukerken, Camiel Doorenweerd, Marko Mutanen, Jean-François Landry, Jeremy Miller, Jeremy R. deWaard
**CONTACT INFORMATION:** Netherlands Centre for Biodiversity, Naturalis, PO Box 9557, NL-2300 RA Leiden, The Netherlands, Email: erik.vannieukerken@naturalis.nl
**TITLE:** A great inventory of the small: combining BOLD datamining and focused sampling hugely increases knowledge of taxonomy, biology, and distribution of leafmining pygmy moths (Lepidoptera: Nepticulidae)
**ABSTRACT:** The ca 850 named Nepticulidae in ca 10 genera form part of an unknown larger global diversity. Traditional methods to investigate their diversity and host plant relations require considerable human effort. DNA barcodes can speed up recognition of host plant relations, distribution and taxonomy. We built a barcode dataset from barcoding leafmining larvae and adults from focused sampling, study of museum specimens, and barcoding initiatives. We mined Barcode of Life Datasystems (BOLD) for all barcoded specimens labelled with the family name, and additionally searched for closely-allied Barcode Index Numbers (BINs) lacking family level taxonomy. We found almost 5,500 barcoded specimens, representing 928 BINs and ca 890 species, of which more than 55% are unnamed or unidentified. Around 2,500 specimens originate from massive malaise trapping programme at BIO, and were initially identified only to order or family level. We use our data for estimating the unknown biodiversity of Nepticulidae, globally and per continent. For North America alone, our results suggest at least 30 unnamed species, confirm 10 species as Holarctic, including several newly recorded, link

previously unidentified host records to named adults. Barcoding mass-trapped specimens showed an unprecedented increase in our knowledge of distribution, host plant use, and invasiveness of an intractable and otherwise poorly known group. Such records, however, acquire scientific value only if validated by a solid barcode reference library that has been vetted by taxonomic expertise. We advocate combining large-scale biodiversity inventories with DNA barcoding.

**D001** – Student Poster
**AUTHOR(S):** Julia Snyder, Timothy J. Anderson, Jennifer M. Zaspel
**CONTACT INFORMATION:** Department of Entomology, Purdue University, 901 W. State Street, West Lafayette, IN 47907, Email: mccart31@purdue.edu
**TITLE:** Survey of secondary plant metabolites in tiger moths (Lepidoptera: Erebidae: Arctiinae)
**ABSTRACT:** Arctiinae, or tiger moths, are known to use plant toxins (i.e. pyrrolizidine alkaloids – PA's) for chemical defense and mating purposes. These plant defensive chemicals can be acquired by tiger moths as larvae or adults. This exploratory study was focused on adult chemical acquisition strategy, referred to as pharmacophagy or self-medication, for protection against parasitoids and predators. Individuals were chosen based on previously published records of adult pharmacophagy. The goal was to test for variation in chemical profiles of pyrrolizidine alkaloids (PAs) within the same species and among different species. Metabolites were extracted from 40 whole body specimens from North American, Thailand, and Costa Rica. Three replicates were used for each species when available and wing vouches were taken to allow for conformation of specimen identification. Chemical profiles were generated using high performance gas chromatography mass-spectrometry (HPGC-MS). The resulting chemical profiles were analyzed against a PA database and determined that 11 out of the 15 species contained putative PA compounds.

**D002** – Student Poster
**AUTHOR(S):** Robert Behring, Matt Ginzel, Jennifer M. Zaspel
**CONTACT INFORMATION:** Department of Entomology, Purdue University, 901 W. State Street, West Lafayette, IN 47907, Email: mccart31@purdue.edu
**TITLE:** Distribution, ecology and adult feeding behavior in the Canadian owlet moth, *Calyptra canadensis* (Bethune, 1865)
**ABSTRACT:** Vampire moths in the genus *Calyptra* (Bänziger) are unique in that they are the only known moths to have specialized in hameatophagy by using their proboscises to pierce vertebrate hosts. This behavior has been adapted from their normal fruit piercing feeding strategy so that they can facultatively feed on blood. *Calyptra* are primarily distributed in the old world except for *Calyptra canadensis* (Bethune, 1865), which is the only species known from North America. Even though *C. canadensis* occurs in North America, little is known about its distribution and no adult feeding records exist.

This study examined specimen data from 13 North American insect collections and the British Natural History Museum. Locality data was compiled along with climatological and topological data into Q-GIS to produce a predictive distribution map with macroclimate data. Last, both field and laboratory experiments were conducted to

document adult feeding behaviors and host preferences in *C. canadensis*. Field studies consisted of both no choice and dual choice tests with both animal and fruit volatiles.

**D003** – Contributed Poster
**AUTHOR(S):** Ryan A. St Laurent, Jason J. Dombroskie
**CONTACT INFORMATION:**
**TITLE:** Revision of the genus *Menevia* Schaus, 1928 (Lepidoptera: Mimallonoidea: Mimallonidae) with descriptions of several new species
**ABSTRACT:** The genus *Menevia* Schaus, 1928 is revised to include several new species and one species previously assigned to *Pamea* Walker, 1855. Recent analysis of biogeography and genitalia traits revealed several cryptic species that were previously considered conspecific with three wide-ranging species. Formal descriptions were lacking for females of nearly all species; here we provide descriptions for the females of most species. A neotype is designated for *Menevia plagiata* (Walker, 1855). Additionally, *Pamea ostia* (Druce, 1898) is transferred to *Menevia* and *P. parostia* Schaus, 1928 is found to be synonymous with *P. ostia*. The name *Mimallo saturata* Walker, 1855 was questionably associated with specimens belonging to the genus *Menevia* but the type specimen of *M. saturata* is assumed lost and as of yet no species of Mimallonidae match Walker's description and thus this name is deemed nomen nudum. The biogeography of the genus *Menevia* is discussed.

**D004** – Contributed Poster
**AUTHOR(S):** Debbie L. Matthews, Jacqueline Y. Miller, Andrew D. Warren, James K. Toomey, Roger W. Portell, Terry A. Lott, Nick V. Grishin
**CONTACT INFORMATION:** McGuire Center for Lepidoptera and Biodiversity and Dickinson Hall, Florida Museum of Natural History, University of Florida, P. O. Box 117800, Gainesville, FL 32611-7800 USA
**TITLE:** Guantanamo blues: taking a closer look at *Cyclargus* (Lepidoptera: Lycaenidae) from Cuba
**ABSTRACT:** Lists of Cuban butterflies include but a single species of *Cyclargus*: *C. ammon*. To our surprise, recent Lepidoptera surveys of the US Naval Base, Guantanamo Bay turned up 3 specimens of *C. thomasi* along with 11 *C. ammon*, as confirmed by genitalic dissection. Examination of McGuire Center specimens curated as *C. ammon* revealed an additional 18 *C. thomasi* from the Guantanamo province. Morphological study of *Cyclargus* from Florida, the Bahamas, and West Indies confidently outlined variation and diagnostic characters of *C. thomasi* vs. *C. ammon* by wing patterns, male and female genitalia. However, CO1 DNA barcode sequences of Guantanamo *C. thomasi* and *C. ammon* were identical. Moreover, nearly 100 CO1 barcodes of *Cyclargus* across the range revealed less than 1% difference and poor correlation between CO1 haplotypes and species. Being very closely related, these species are likely to hybridize, leading to introgression, possibly complicated by incomplete lineage sorting.

**D005** – Contributed Poster
**AUTHOR(S):** Delano S. Lewis, Felix A. H. Sperling , Shinichi Nakaharaa, Adam M. Cotton, Akito Y. Kawaharaa and Fabien L. Condamine
**CONTACT INFORMATION:** Director - Office of Research & Grants, Dept. Bio.,

Chem., & Environ. Sci., Northern Caribbean University, Mandeville, Jamaica, W.I., Phone: 1-876-963-7744, Email: delano.lewis@ncu.edu.jm
**TITLE:** Role of Caribbean Islands in the Diversification and Biogeography of Neotropical *Heraclides* Swallowtails
**ABSTRACT:** Numerous hypotheses on the evolution of Neotropical biodiversity have stimulated research to provide a better understanding of diversity dynamics and distribution patterns of the region. However, few studies integrate molecular and morphological data with complete sampling of a Neotropical group, and so there has been little synthesis of the multiple processes governing biodiversity through space and time. Here, a total-evidence phylogenetic approach is used to reconstruct the evolutionary history of the butterfly subgenus *Heraclides*. We used DNA sequences for two mitochondrial genes and one nuclear gene and coded 133 morphological characters of larvae and adults. A robust and well-resolved phylogeny was obtained using several analytical approaches, while molecular dating and biogeographical analyses indicated an early Miocene origin (22 Mya) in the Caribbean Islands. We inferred six independent dispersal events from the Caribbean to the mainland, and three from the mainland to the Caribbean, and we suggest that cooling climates with decreasing sea levels may have contributed to these events. The time-calibrated tree is best explained by a museum model of diversity in which both speciation and extinction rates remained constant through time. By assessing both continental and fine-scale biodiversity patterns, this study provides new findings, for instance that islands may act as source of diversity rather than as a sink, to explain spatio-temporal macroevolutionary processes within the Neotropical region.

**027** – Keynote Speaker
**AUTHOR(S):** Geoff Martin
**CONTACT INFORMATION:** Department of Life Sciences The Natural History Museum Cromwell Road London SW7 5BD, Email: g.martin@nhm.ac.uk
**TITLE:** iCollections project: the digitisation of the British & Irish Lepidoptera collection at the Natural History Museum, London
**ABSTRACT:** This collection was chosen as a pilot project for the digitisation of the museum's collections. The project started in January 2013 and is expected to take three years to complete. The talk will go through the digitisation process highlighting the many issues and show the results so far including research and curation benefits. The unlocking of these data will be of enormous benefit to those interested in the British and Irish Lepidoptera, will be accessible to all on the museum's data portal and will set the standard for future museum digitisation projects.

**028** – Contributed Paper
**AUTHOR(S):** James Adams
**CONTACT INFORMATION:** Email: jadams@daltonstate.edu
**TITLE:** Digitization of Sphingids and Saturniids at the McGuire
**ABSTRACT:** The McGuire Center for Lepidoptera and Biodiversity at the Florida Museum of Natural History in Gainesville, Florida is working toward digitizing its collection. This May through July I worked on a project with Akito Kawahara to image three sphingid genera (*Eumorpha*, *Manduca*, *Xylophanes*) and hemileucine

saturniids. For each species, images were taken of upperside and underside of both male and female, and additional specimens were imaged when there is some significant variation. This is part of NSF's goal to digitize natural history collections in the U.S. Not only does it represent photographic documentation of what IS in the collection, but will ultimately be available to researchers via IDIGBIO and other NSF funded initiatives.

**029** – Contributed Paper
**AUTHOR(S):** Mirian M. Hay-Roe, Rodney N. Nagoshi, Robert L. Meagher
**CONTACT INFORMATION:**
**TITLE:** Effects of cyanogenic compounds on the host strains of the fall Armyworm (*Spodoptera frugiperda*)
**ABSTRACT:** *Spodoptera frugiperda* (J. E. Smith) consists of two genetic subgroups (host strains). The corn strain prefers tall grasses such as corn and sorghum, while the rice strain is found in small grasses such as *Cynodon* spp. and pastures. Little is known about the physiological factors that drive this host preference. Here, we report a feeding study with natural host plants and an artificial diet containing cyanide. We found that fall armyworm host strains differ in their susceptibility to cyanide levels in various host plants, and we unravel the chemical composition of *Cynodon* grasses.

**030** – Contributed Paper
**AUTHOR(S):** Christi Jaeger, Richard L. Brown
**CONTACT INFORMATION:** Mississippi Entomological Museum, 100 Old Hwy 12, Clay Lyle Entomology Bldg. Mississippi State, MS 39762, Email: cjaeger@entomology.msstate.edu
**TITLE:** Moth Photographers Group: recent developments and future undertakings
**ABSTRACT:** The Moth Photographers Group (MPG) is the largest and most comprehensive digital moth identification resource in the world; MPG is also the most visited webpage hosted by Mississippi State University. Robert Patterson founded MPG in 2004, and until recent health issues, he has been the site's most dedicated contributor. This will be a presentation of the website's conceptualization, statistics, and future undertakings. Current strategies to maintain the website, including new features, will be presented; the most significant new feature being the addition of 75 species pages for exotic moths of potential concern.

**031** – Contributed Paper
**AUTHOR(S):** Kojiro Shiraiwa, Qian Cong, Nick V. Grishin
**CONTACT INFORMATION:** UT Southwestern, 5323 Harry Hines Blvd., Dallas, TX 75390-9050, Phone: 214-645-5952, Email: grishin@chop.swmed.edu
**TITLE:** A new *Heraclides* swallowtail (Lepidoptera, Papilionidae) from North America is recognized by the pattern on its neck
**ABSTRACT:** We recently described *Heraclides rumiko* from southwestern United States, Mexico, and Central America (type locality: USA, Texas, Duval County). It is closely allied to *Heraclides cresphontes* (Cramer, 1777) and the two species are sympatric in central Texas. The new species is diagnosed by male genitalia and exhibits a nearly 3% difference from *H. cresphontes* in the COI DNA barcode sequence of mitochondrial DNA. The two *Heraclides* species can usually be told apart by the shape

and size of yellow spots on the neck, by the wing shape, and the details of wing patterns. We sequenced DNA barcodes and ID tags of over 400 Papilionini specimens completing coverage of all *Heraclides* species. Comparative analyses of DNA barcodes, genitalia, and facies suggest taxonomic adjustments in the genus.

**032** – Contributed Paper
**AUTHOR(S):** Erik Runquist
**CONTACT INFORMATION:** Minnesota Zoo, 13000 Zoo Blvd, Apple Valley, MN 55125, Phone: 952-431-9562, Email: Erik.Runquist@state.mn.us
**TITLE:** Saving endangered butterflies
**ABSTRACT:** Prairies once covered most of central North America, but now only 1% remains. As a result, many prairie butterflies are in decline. Two of these, the Poweshiek skipperling and Dakota skipper, were recently listed in the US as Endangered and Threatened species. The Minnesota Zoo is partnering with many international, federal, state, and local officials to prevent the extinction of these and other prairie butterflies. We are working to establish conservation insurance populations of these imperiled butterflies at the Zoo, conducting surveys at historic and potential sites, studying population genetics, identifying threats and potential solutions at local and regional levels, and performing outreach. These butterflies serve as indicators of the overall health of the remaining prairie, and are a significant component of our natural and cultural heritage.

**033** – Contributed Paper
**AUTHOR(S):** Vazrick Nazari
**CONTACT INFORMATION:** 60 Carling Ave., Ottawa ON Canada K1A 0C6, Phone: 613-715-5009, Email: nvazrick@yahoo.com
**TITLE:** Butterflies in Rock Art
**ABSTRACT:** A review of Lepidopteran depictions in petroglyphs, pictograms and cave art from around the world is presented. Potential significance of these depictions is discussed.

**034** – Contributed Paper
**AUTHOR(S):** Chris Grinter
**CONTACT INFORMATION:** Collections Manager of Insects, Illinois Natural History Survey, 1816 S Oak Street, Champaign, IL 61820-0904, Email: cgrinter@gmail.com
**TITLE:** The Past and Future of Lepidoptera Collections at the Illinois Natural History Survey
**ABSTRACT:** The INHS has one of the most significant historical collections in the US. The Lepidoptera holdings consist of ~2,000 drawers, dating back to the 1860's Midwest. A brief history of the collection and significant contributions will be discussed. While large digitization projects have been occurring at the Survey for 10 years, essentially nothing has happened within the Lep collection. Moving foreword, there will be much greater accessibility of the collection both in terms of online data and access to specimens.

**035** – Keynote Speaker
**AUTHOR(S):** John Shuey

**CONTACT INFORMATION:** Director of Conservation Science, The Nature Conservancy, Indiana Field Office, 620 E. Ohio St. Indianapolis, IN 46202, Phone: 317.829.3898, Email: jshuey@TNC.ORG
**TITLE:** An Overview of Indiana Habitats and Conservation
**ABSTRACT:** Indiana is not just vast fields of corn and beans. A whirlwind tour of the state, highlighting habitat not typically associated with the state – from cypress sloughs to jack pine barrens, will be presented. This presentation will also highlight progress at the Nature Conservancy's restoration project at Kankakee Sands, including the first public look at data from last year's intensive assessment across the site.

**035** – Keynote Speaker
**AUTHOR(S):** John Shuey
**CONTACT INFORMATION:** Director of Conservation Science, The Nature Conservancy, Indiana Field Office, 620 E. Ohio St. Indianapolis, IN 46202, Phone: 317.829.3898, Email: jshuey@TNC.ORG
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**036** – Contributed Paper
**AUTHOR(S):** Akito Y. Kawahara, David Lohman, Rob Guralnick, Naomi E. Pierce
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**TITLE:** ButterflyNet: An integrative framework for comparative biology
**ABSTRACT:** Butterflies are the best known of all insect taxa, making them the ideal target for comparative studies. This recently-funded NSF project will produce the first fully resolved species-level phylogeny of a major insect clade, butterflies, and synthesize available databases on species distributions, host associations, and other life-history traits. This accumulated knowledge from centuries of observations and ongoing research will be delivered through an integrative, online platform to a broad community of researchers and the general public.

**037** – Contributed Paper
**AUTHOR(S):** Neil S. Cobb and LepNet Consortium
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**TITLE:** Lepidoptera of North America Network: Documenting Diversity in the Largest Clade of Herbivores
**ABSTRACT:** Insect herbivores and their host plants dominate terrestrial biomes and may constitute nearly half of the earth's biodiversity. With more than 157,000 described species worldwide and 14,300 species in 80+ families documented for the United States,

the Lepidoptera (butterflies and moths) are one of the primary insect groups responsible for the radiation of flowering plants, and their evolutionary and ecological interactions are of highest relevance to pure and applied science (e.g., genetics, development, biogeography, coevolution, and agriculture). The attraction and diversity of butterflies and moths profoundly inspire children and adults of all ages and can therefore promote public understanding of their relevance to society like no other group of arthropods. Museums in the United States contain anywhere from 9-15 million specimens of Lepidoptera, however less than 600,000 of these have been digitized, and consequently no more than 10% of the North American species have sufficient accessible occurrence data to make reliable predictions concerning their habitat use, susceptibility to global change impacts, or other spatially and temporally deep-scale interactions. Both additional digitization and integration of existing but unconnected efforts are urgently needed to leverage the unparalleled potential of Lepidoptera to anchor national digitization efforts of our mega-diverse arthropod holdings, and translate these data into transformative research and outreach.

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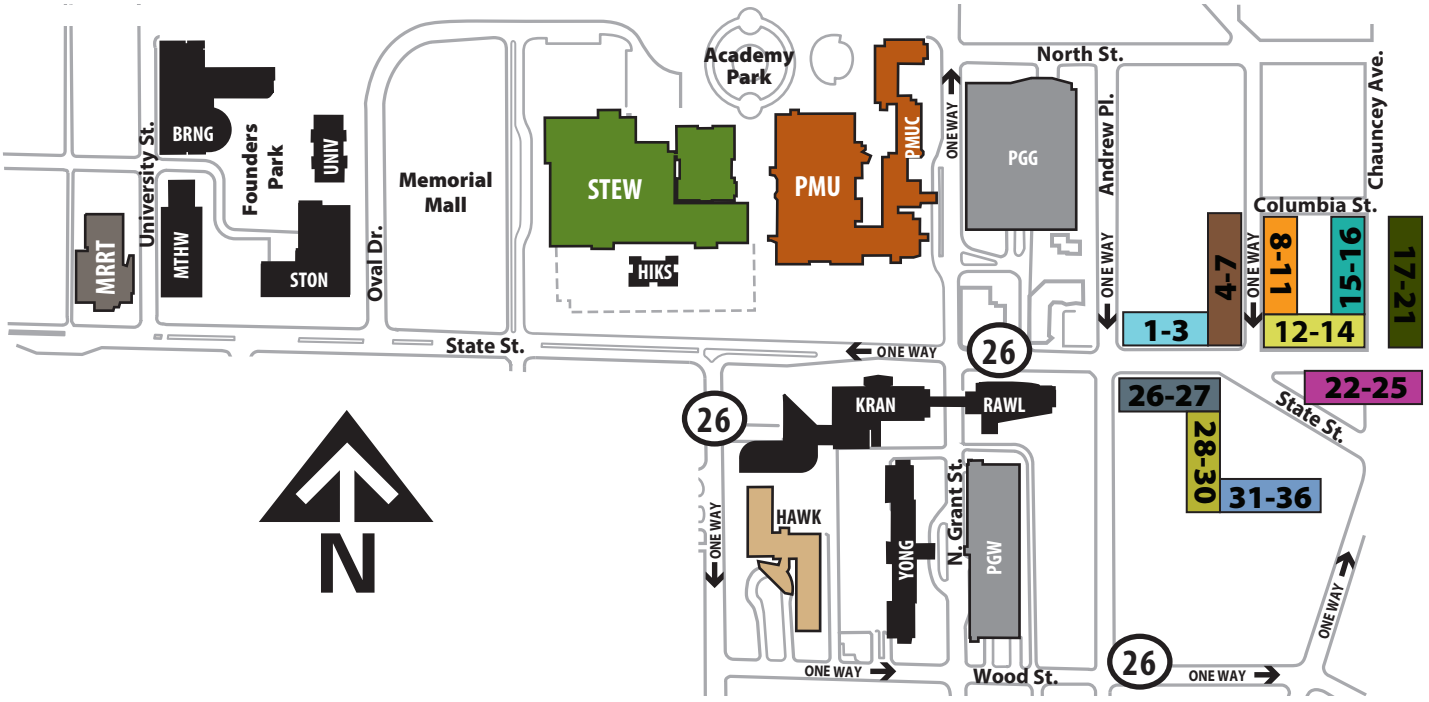


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- Newsstand

### MARRIOT HALL (MRRT)

- Boiler Bistro
- Lavazza

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