THE LEPIDOPTERISTS' SOCIETY
34th ANNUAL MEETING

PROGRAM

AND

ABSTRACTS

The Ohio State University

Fawcett Center for Tomorrow
2400 Olentangy River Road
Columbus, Ohio 43210

7-10 July 1983

Sponsored by
THE OHIO LEPIDOPTERISTS
in cooperation with the
OHIO BIOLOGICAL SURVEY
and the
DEPARTMENT OF ENTOMOLOGY
COLLEGE OF BIOLOGICAL SCIENCES
THE OHIO STATE UNIVERSITY

The public is cordially invited to attend the sessions and exhibits of this meeting.

Welcome to Ohio!

Landforms and physiographic regions of Ohio.

Adapted from and used by courtesy of James A. Bier, and the Division of Geological Survey, Ohio Department of Natural Resources.

THE LEPIDOPTERISTS' SOCIETY 34th ANNUAL MEETING

PROGRAM

THURSDAY, 7 JULY 1983

1:00 PM to 5:00 PM **Registration,** Lobby of Fawcett Center for Tomorrow

1:00 PM to 5:00 PM **Executive Council Meeting,** Fawcett Center for Tomorrow

1:00 PM to 5:00 PM **Open Houses at Insect Collections** (see map in the Registrant's Packet)

Charles A. Triplehorn, Curator
Department of Entomology
The Ohio State University
Botany & Zoology Bldg., Room 302
1735 Neil Avenue
Columbus, OH 43210

The collection at The Ohio State University includes the Leussler Collection (Nebraska and Midwestern Material), the Price Collection (northwestern Ohio material), and other Ohio material. A parking permit will be required to park near the Botany and Zoology Building. Obtain one at the Meeting Registration Desk in the Fawcett Center for Tomorrow.

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William T. Schultz,
Curator of Natural History
The Ohio Historical Center
Interstate 71 & 17th Avenue
Columbus, OH 43211

The collection at The Ohio Historical Society contains the collections of John Thomas, Ray Romine, and Clement Baker (all of Ohio material) and additional Ohio material. A parking fee of $2.00 will be charged.

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7:00 PM to 10:00 PM **"The Crepuscular Hour,"** an open house at the Metzler residence (see map and other information in the Registrant's Packet)

Eric, Pat, and Meredith Metzler
1241 Kildale Square, North
Columbus, OH 43229
Phone: (614) 888-3642

FRIDAY, 8 JULY 1983

8:00 AM to 5:00 PM **Registration,** Lobby of Fawcett Center for Tomorrow.

8:00 AM to 5:00 PM **Displays and Exhibits,** Room 4, Fawcett Center for Tomorrow

8:00 AM Coffee & Donuts, Lobby of Fawcett Center for Tomorrow

SESSION I—Assembly Hall, Fawcett Center for Tomorrow

Lowell R. Nault, Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, OH, *Presiding*

8:45 AM **Announcements.** Eric H. Metzler, Ohio Department of Natural Resources, Columbus, OH, Conference Chairperson.

8:55 AM **Welcome to the University.** Patrick R. Dugan, Dean, College of Biological Sciences, The Ohio State University, Columbus, OH.

9:05 AM **Presenting The Ohio Lepidopterists.** Reed A. Watkins, President, The Ohio Lepidopterists, Spring Valley, OH.

9:20 AM **Formation and Diversity of the Ohio Landscape.** Charles C. King, Ohio Biological Survey, Columbus, OH.

9:40 AM **Wetland Classification and Lepidopteran Habitat Requirements.** John A. Shuey, The Ohio State University, Columbus, OH.

9:55 AM **The Northern Distribution of *Euphyes dukesi* (Hesperiidae).** Leland L. Martin, Wakeman, OH.

10:15 AM **Dukes' Skipper Colony Becomes Ohio State Parks' First Nature Sanctuary.** Nancy Stranahan, Ohio Department of Natural Resources, Columbus, OH.

10:25 AM Coffee Break.

10:45 AM **The Cleveland Museum of Natural History Lepidoptera: The Collection, the Biological Records Program of Northeastern Ohio, and the Tagging of Monarchs.** Sonja Teraguchi, The Cleveland Museum of Natural History, Cleveland, OH.

11:05 AM **The dos Passos Connection.** Bob Lee Mowery, Wittenberg University, Springfield, OH. Steve Chunglo, presenter.

11:20 AM **Reflections on the Progress of the Lepidopterists' Society and North American Lepidopterology. The Presidential Address.** Charles V. Covell, Jr., University of Louisville, Louisville, KY.

12:01 PM **Group Photograph.** ($5.00 per print, payable ***in cash*** at the Registration Desk.)

12:15 PM Lunch (on your own)

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SESSION II—Assembly Hall,
Fawcett Center for Tomorrow

Austin P. Platt, University of Maryland Baltimore County, Catonsville, MD, *Presiding*

1:45 PM **Butterflies of Pennsylvania.** John Prescott, Erie, PA.

2:00 PM **Lepidoptera in the Pine Ridge, Nebraska.** Clifford D. Ferris, University of Wyoming, Laramie, WY.

2:15 PM **Cladistic Analysis and Vicariance Biogeography in Studies of Lepidoptera.** Eric L. Quinter and Kurt Johnson, American Museum of Natural History, New York, NY. Eric L. Quinter, presenter.

2:35 PM ***Hamadryas* in the United States of America.** Dale W. Jenkins, Allyn Museum of Entomology, Sarasota, FL.

2:50 PM **Taxonomy, Ecology, and Sexual Saltation in *Myscelia*.** Dale W. Jenkins, Allyn Museum of Entomology, Sarasota, FL.

3:05 PM **The Identification of Two Species of *Junonia* Hubner (Nymphalidae), *J. evarete* and *J. genoveva*, in Jamaica with the Establishment of Neotypes for Both Species.** T.W. Turner, Agri-Trade, Inc., Clearwater, FL, and J.R. Parnell, University of the West Indies, Kingston, Jamaica. T.W. Turner, presenter.

3:25 PM **Reinthal's *Asterocampa*.** Tim Friedlander, Texas A & M University, College Station, TX.

3:35 PM Coffee Break.

3:55 PM **Phenotypic Divergence and Gene Flow in Blending Populations of *Limenitis (Basilarchia) arthemis* – *astyanax* in the Northeastern United States of America.** Austin P. Platt, University of Maryland, Baltimore County, Catonsville, MD.

4:15 PM **Pronophilini (Satyridae) of Mexico.** Lee D. Miller, Allyn Museum of Entomology, Sarasota, FL.

4:30 PM **The Systematic Position of the Named North American Forms of *Boloria (Clossiana) titania* and *Boloria (Clossiana) chariclea* (Lepidoptera: Nymphalidae).** Ted Pike, University of Alberta, Edmonton, Alberta.

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7:00 PM to 9:30 PM **Beer, Brats, and Butterflies**

Riverview Restaurant
Columbus Zoo
9900 Riverside Drive
Powell, Ohio 43065
Herr Metzler, *Zeremonienmeister*

(Pre-registration required; see "Family Activities"; see map and other information in the Registrant's Packet)
The visit to the Zoo will include an Oktoberfest-style meal. To gain free admission to the Zoo, arrive between 6:00-7:00 PM, go the main gate, and announce that you are attending The Lepidopterists' Society 34th Annual Meeting. If you arrive after 7:00 PM, go to the service entrance where a security guard will eventually let you in. They are on duty in other areas of the Zoo and may not be present when you arrive, but just wail till one lets you in.

9:30 PM to 11:30 PM **"Slidefest"** at the Riverview Restaurant, Columbus Zoo, Mogens C. Nielsen, Lansing, MI, will present a program of his recent collecting trip to Isle Royale National Park. Bring your slides to share with the group.

SATURDAY, 9 JULY 1983

8:30 AM to 11:30 AM **Registration,** Lobby of Fawcett Center for Tomorrow

8:30 AM to 5:00 PM **Displays and Exhibits,** Room 4, Fawcett Center for Tomorrow

8:30 AM Coffee & Donuts, Lobby of Fawcett Center for Tomorrow

SESSION III—Assembly Hall, Fawcett Center for Tomorrow

Symposium: CURRENT RESEARCH ON THE BIOLOGY OF THE LEPIDOPTERA, Lincoln P. Brower, University of Florida, Gainesville, FL, and Theodore D. Sargent, University of Massachusetts, Amherst, MA, Cochairpersons, *Presiding.*

9:00 AM **Movement and Dispersal in *Euphydryas gillettii* (Nymphalidae).** Ernest H. Williams, Wellesley College, Wellesley, MA.

9:20 AM **The Influence of Bird Predation on Butterfly Populations.** M. Deane Bowers, Harvard University, Cambridge, MA.

9:40 AM **The Startle Response of Bluejays to *Catacola* (Noctuidae) models.** Debra H. Schlenoff, University of Massachusetts, Amherst, MA.

10:00 AM **Predator-prey Interactions: Effect of Physical Constraints of Caterpillar Defensive Behavior.** Nancy E. Stamp, University of California, Davis, CA.

10:20 AM Coffee Break

10:40 AM **Multiple Mating and Sperm Competition in Lepidoptera.** Boyce A. Drummond, Illinois State University, Normal, IL.

11:00 AM **Pupal Color Dimorphisms in Swallowtail Butterflies.** David A. West, Virginia Polytechnic Institute and State University, Blacksburg, VA.

11:20 AM **Rate of Speciation in Eumaeine Hairstreaks (Lycaenidae).** Robert K. Robbins, Smithsonian Institution, Washington, DC.

12:01 PM Lunch (on your own)

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SESSION IV—Assembly Hall, Fawcett Center for Tomorrow

John W. Peacock, Forest Service, United States Department of Agriculture, Delaware, OH, *Presiding*

1:30 PM **Biological Relationships Among Western Spruce Budworms: A Paradox for the Species Category in Taxonomy.** J.A. Powell and J.A. DeBenedictis, University of California, Berkeley, CA. J.A. Powell, presenter.

1:50 PM **The Spruce Budworm *(Choristoneura occidentalis* Freeman: Tortricidae) Problem in the Western United States of America.** Karðlis Bagdonis, Laramie, WY.

2:10 PM **The Migration of Spruce Budworm Moths (Lepidoptera: Tortricidae) in Atlantic Canada.** D.O. Greenbank, G.W. Schaefer, R.C. Rainey, and A.W. Thomas, Canadian Forestry Service, Fredericton, New Brunswick. A.W. Thomas, presenter.

2:30 PM **Observations on the Mating Behavior of the Adult Mimosa Webworm, *Homadaula anisocentra* Meyrick (Lepidoptera: Glyphipterygidae).** John W. Peacock, Forest Service, United States Department of Agriculture, Delaware, OH.

2:45 PM **Exceptional Catches of *Catocala* at Elms Infected with Dutch Elm Disease.** John W. Peacock, Forest Service, United States Department of Agriculture, Delaware, OH.

3:00 PM Coffee Break.

3:20 PM **Melanism in *Phigalia titea* (Cramer) (Geometridae): A Sixteen-year Record from Central Massachusetts.** Theodore D. Sargent, University of Massachusetts, Amherst, MA.

3:40 PM **Questions Raised by Consideration of Protective Coloration and Mimicry as Issues in Transmission of Information from Prey to Predator.** Benjamin H. Landing, University of Southern California, Los Angeles, CA.

3:55 PM **Unusual Behavioral Patterns in Noctuid Larvae.** Roy W. Rings, Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, OH.

4:05 PM **Integumental Structure of Micropterigid Larvae with Special Reference to Plastron Surfaces.** Donald R. Davis, Smithsonian Institution, Washington, DC.

4:20 PM **Cardenolide Fingerprinting of the Monarch Butterfly to its Milkweed Food Plants.** Lincoln P. Brower, University of Florida, Gainesville, FL.

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ANNUAL BANQUET
Fawcett Center for Tomorrow
Charles V. Covell, Jr., President
The Lepidopterists' Society
Master of Ceremonies
(pre-registration required)

6:00 PM Cash Bar
7:00 PM Banquet
8:00 PM Break and Remove to Assembly Hall

8:15 PM Welcome to Columbus. Susal L. Ettl, Director of Public Relations, Greater Columbus Convention Bureau, Columbus, OH.

8:25 PM Awarding of the Karl Jordan Medal (*in absentia)* to Elwood C. Zimmerman, Commonwealth Scientific and Industrial Research Organisation, Canberra, Australia by President Covell.

8:40 PM National Lepidoptera Photographic Salon of award winning slides. Robert Fridenstine, Photographic Society of America, Columbus, OH. Narration by Julian P. Donahue, Los Angeles, CA. The public is invited.

9:40 PM Door Prizes

SUNDAY, 10 July 1983

8:30 AM to 11:30 AM **Displays and Exhibits,** Room 4, Fawcett Center for Tomorrow

8:30 AM Coffee & Donuts, Lobby of Fawcett Center for Tomorrow

SESSION V—Assembly Hall,
Fawcett Center for Tomorrow

Eric H. Metzler, Ohio Department of Natural Resources, Columbus, OH, *Presiding.*

9:00 AM **Lepidoptera That Use *Oxydendrum arboreum* (L) as a Food Plant.** Eric H. Metzler, Ohio Department of Natural Resources, Columbus, OH.

9:15 AM **Observations on an Oak-feeding Population of *Hemileuca lucina* Hy. Edw. (Saturniidae) in Massachusetts.** William D. Winter, Jr., Harvard University, Cambridge, MA.

9:30 AM **The Status of *Papilio homerus* Fabricius in Jamaica, West Indies.** T.W. Turner, Agri-Trade, Inc., Clearwater, FL.

9:45 AM **Interspecific Variation in the Structure of Sulphur Butterfly Courtship and the Evolution of Male Courtship Displays.** Ronald L. Rutowski, Arizona State University, Tempe, AZ.

10:05 AM **Art Meets Science: Butterflies in the History of Art.** Irving L. Finkelstein, Georgia State University, Atlanta, GA.

10:25 AM Coffee Break

10:45 AM to 11:45 AM **Annual Business Meeting.** Charles V. Covell, Jr., University of Louisville, Louisville, KY, *Presiding.*

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2:00 PM **Luncheon at Wittenberg University,** Springfield, OH. (see map in the Registrant's Packet; pre-registration required)

3:00 PM **Viewing of the Cyril F. dos Passos Collection of Books and Journals on Lepidoptera,** Thomas Library, Wittenberg University, Springfield, OH. The viewing will be hosted by Betty Beatty, Acting Director of the University Libraries.

5:00 PM Depart for Field Trips (see details in the Registrant's Packet)

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FIELD TRIPS

Five post-meeting field trips in Ohio are available upon demand. Each trip will be hosted by a member of The Ohio Lepidopterists as follows:

1. Resthaven Wildlife Area, Leland L. Martin
2. Streetsboro Marshes, Dennis A. Currutt
3. Salt Fork State Park, Jeff Hooper
4. Vinton and Hocking Counties, Eric H. Metzler
5. Shawnee State Park/Forest, Reed A. Watkins

Details of each trip, an interest coupon, and a summary of regulations concerning collecting in Ohio are presented in the Registrant's Packet.

EXHIBITS

A non-competitive topical (or thematic) philatelic exhibition centering on butterflies, moths, and/or insects on stamps is being presented in Room 4 by The Columbus Philatelic Club. The exhibition is coordinated by Russell V. Skavaril of the Club and the Department of Genetics, The Ohio State University. The Columbus Philatelic Club has also designed and produced cacheted covers and a special pictorial cancellation to commemorate the Meeting. These items and some stamps will be on sale in the exhibit area.

Several other educational exhibits will be presented in Room 4, and commercial exhibitors will be located in Room 1 throughout the Meeting.

PARKING

Parking facilities at the Fawcett Center for Tomorrow are spacious. However, park only in areas marked with blue "Visitor Parking" signs. Parking in other locations may result in parking tickets.

Parking on the main campus is limited, and frequently, risky regarding parking tickets. For house guests using Drackett Tower Dormitory, directions to an appropriate parking lot and parking permits are available for about $1.00 per day at the Drackett Tower registration desk. If you need to park on the main campus check first at the Meeting Registration Desk in the Fawcett Center for Tomorrow.

A $2.00 parking fee is charged at the Ohio Historical Center and parking is free at the Columbus Zoo. Parking is free at the Holiday Inn on the Lane for house guests.

FAMILY ACTIVITIES

Family members are welcomed to the Meeting. Special activities are being planned for spouses and children who may not desire to attend some of the sessions. Planned activites include sightseeing tours and mini-trips, shopping trips, and a pool and pizza party at the Holiday Inn on the Lane. On Thursday evening, all are invited to an open house, "The Crepuscular Hour," at the Metzler residence. A special Friday night outing at the Columbus Zoo will include an Oktoberfest-style meal (pre-registration required). Child care facilities and qualified personnel will be available during the Annual Banquet (pre-registration required). Please fill in the appropriate interest coupons in the Registrant's Packet and mail with your Registration Form.

WEATHER

The weather in Columbus, Ohio in July is usually hot and humid. Daytime temperatures are usually mid 70's to mid 80's (F), and nighttime temperatures are mid 60's to mid 70's. It can be cooler or warmer, however. Afternoon and evening thunderstorms are common.

Detach and Mail

REGISTRATION FORM

(Pre-registration is very important*)

The Lepidopterists' Society 34th Annual Meeting

7-10 July 1983

Name_____ Phone_____

Mailing Address_____

City_____ State_____ Zip_____

Registration Fee $25.00 _____

* Beer, Brats, and Butterflies at the Columbus Zoo including an Oktoberfest-style meal, Friday 8 July

adults, $7.00 each _____

children, $5.50 each _____

* Annual Banquet, Swiss Steak, Saturday 9 July $10.00 each _____

* Luncheon at Wittenberg University, Sunday 10 July $6.50 each _____

Total _____

Make check payable to Ohio Biological Survey and return this registration form to:

The Lepidopterists' Society 34th Annual Meeting
Ohio Biological Survey
484 W. 12th Avenue
Columbus, Ohio 43210

Confirmation of registration will be mailed to all who register by 24 June 1983.

* Pre-registration (including pre-payment) required by 1 July 1983 to guarantee availability of tickets.

Please reserve housing for me in the Drackett Tower Dormitory as indicated:

	Single	Double	Triple	Quad
night of 7 July, Thursday	____	____	____	____
night of 8 July, Friday	____	____	____	____
night of 9 July, Saturday	____	____	____	____
night of 10 July, Sunday	____	____	____	____

Name(s) of roomate(s)_____

Indicate those who are 5 years old or younger._____

Payment for this type of housing is not due until arrival.

THE LEPIDOPTERISTS' SOCIETY
EST. 1947

NOTES

SPONSORSHIP AND PLANNING

The Meeting is hosted by The Ohio Lepidopterists in cooperation with the Ohio Biological Survey and the Department of Entomology, both of the College of Biological Sciences, The Ohio State University. Also cooperating are The Ohio Historical Society, Wittenberg University, the Columbus Zoo, and the Holiday Inn on the Lane. Meeting facilities are arranged through the Office of Continuing Education, The Ohio State University.

Mr. Eric H. Metzler of The Ohio Lepidopterists is Chairperson of the Planning Committee which consists of the following: Susan Ahearn, Carl W. Albrecht, Frank Bolin, Paul Brand, John Calhoun, Charles V. Covell, Jr., Dennis A. Currutt, Robert Fridenstine, D. Lyle Goleman, Charles C. King, Rosemary Kullman, Bob Lee Mowery, Lowell R. Nault, Mogens C. Nielsen, Kenneth D. Ostrand, Ralph E. Ramey, Russell V. Skavaril, and Reed A. Watkins.

Additional assistance has been provided by the following: Tim Bargar, Barbara Bloetscher, Lynn Brand, Jan Bolin, Julian P. Donahue, John Condit, Judith B. Fountain, Lois Golding, Michael C. Hansen, Jeff Hooper, Anita C. King, Patricia Marie, Leland L. Martin, Pat Metzler, Beverly H. Moseley, Richard E. Moseley, Jr., John W. Peacock, Leslie Phillips, Daniel Province, Janet Province, Karen Jennings Reese, Roy W. Rings, Sandra D. Rutowski, William T. Schultz, John A. Shuey, LeRoy Simon, Alvin E. Staffan, James E. Stahl, Charles A. Triplehorn, and Charlene Tweedy.

MESSAGES & INFORMATION

A "Message Board" will be available at the Meeting Registration Desk from 1:00 PM Thursday 7 July to 11:30 AM Sunday 10 July for personal messages and for updated information regarding all aspects of the Meeting. Personal messages phoned to the Fawcett Center for Tomorrow, (614) 421-2400, will, upon request, be forwarded to the Message Board.

FOR MORE INFORMATION CONTACT:

Ohio Biological Survey
484 West 12th Avenue
Columbus, Ohio 43210
Phone (614) 422-9645

or

Eric H. Metzler
1241 Kildale Square, N.
Columbus, Ohio 43229
Phone (614) 265-6507
or
(614) 888-3642

ABSTRACTS

The abstracts are arranged in order of presentation in the Program.

PRESENTING THE OHIO LEPIDOPTERISTS. Reed A. Watkins, The Ohio Lepidopterists,9258 Clyo Road, Spring Valley, OH 45370

The organization known as The Ohio Lepidopterists was founded in 1979 by Carl W. Albrecht and Eric H. Metzler. Starting from a group of about 20 persons who attended a workshop at the Ohio Historical Society, the group has grown to its present membership of about 130. Through group activities and a newsletter, both amateurs and professionals share an interest in the Lepidoptera of Ohio.

Several field trips are held each year, and an effort is being made to collect in all areas of the state. Several members are interested in compiling distribution data. One or two general meetings are also held each year, usually at nature centers or museums. Some meetings include a program of contributed presentations. Publication of Research Reports has been undertaken in cooperation with the Ohio Biological Survey. As a convenience to members, a sales program provides selected publications and supplies such as insect pins and glassine envelopes at competitive prices.

This organization, as others before it, confirms the great benefit which derives to those who band together close to home in order to focus on and enjoy the natural treasures of their own region.

FORMATION AND DIVERSITY OF THE OHIO LANDSCAPE. Charles C. King, Ohio Biological Survey, 484 West 12th Avenue, The Ohio State University, Columbus, OH 43210

Ohio is completely underlain by sedimentary rocks of Paleozoic depositions. Mesozoic and Cenozoic erosional cycles removed substantial amounts of these sediments; and in the eastern half of the state, the surficial bedrocks are predominately acidic shales, sandstones, siltstones, and coals, while alkaline shales, limestones, and dolomites predominate in western Ohio. The master stream draining most of preglacial Ohio was the northwesterly flowing Teays River. During the Pleistocene, glacial ice covered the northern and western two-thirds of Ohio, obstructing the Teays and producing rearranged drainage patterns, with the Ohio River eventually being developed as the master stream in the region. The numerous glacial advances, retreats, and resulting deposits and drainage modifications contributed much diversity to landscapes and habitats throughout Ohio. At settlement, Ohio was 95 percent forested. This was reduced to 15 percent by 1940 and has since increased to 25 percent.

The physiographic regions of Ohio are as follows: 1) Unglaciated Appalachian Plateau--rugged, hilly, with mixed oak and mixed mesophytic forests, now heavily forested with small farms and stripmines; 2) Glaciated Appalachian Plateau--rolling, hilly, with beech, mixed mesophytic, and mixed oak forests, and bogs, now lightly forested, agricultural, and urbanized; 3) Lake Plains--very flat former lake beds with elm-ash-silver maple swamp forests and marshes, now heavily agricultural; 4)Till Plains--flat to hummocky to hilly in the south with beech, oak-sugar maple, and mixed mesophytic forests, prairies, and fens, now heavily agricultural; 5) the Bluegrass Region--flat topped hills and steep valleys with oak-sugar maple and mixed oak forests and cedar glades, now in small farms and lightly forested.

WETLAND CLASSIFICATION AND LEPIDOPTERAN HABITAT REQUIREMENTS. John A. Shuey, Department of Entomology, The Ohio State University, Columbus, OH 43210

Six basic types of wetland botanical communities occur in the Ohio sub-region. They are generally characterized as pioneer, now often relict communities. Fens, bog meadows, sedge meadows, and open marshes represent communities which may have been characteristic of plant associations adjacent to the retreating glacier. These botanical communities survive in isolated pockets of poor drainage and cool microclimate. Bog forests and swamps represent communities which replaced the pioneering communities as a result of natural habitat modification. In addition to floristic differences, the community types generally differ in drainage patterns, soil types, and soil pH.

Lepidopterists generally refer to these communities with terms which are poorly defined and generally misused. For example, fens are generally referred to as cedar swamps, cedar bogs, tamarack swamps, wet meadows, sedge meadows, etc... Unless a physical or botanical description is given for each site, it is generally impossible to deduce the true nature of the habitat being discussed.

Thus, the habitat requirements of most wetland Lepidoptera remain unknown. Each of the six basic wetland communities probably supports a unique association of Lepidoptera. A more thorough knowledge of these associations will result in a better understanding of wetland Lepidoptera biogeography and the evolutionary ecology of such communities.

THE NORTHERN DISTRIBUTION OF EUPHYES DUKESI (HESPERIIDAE). Leland L. Martin, R.D. 2, Box 158, 5625 Leroy Road, Wakeman, OH 44889

Several sedge feeding species of the genus Euphyes Scudder have a pattern of distribution covering portions of both the Southern and Northern areas of the Eastern United States. Euphyes dukesi (Lindsey), one of the most recently described (1923) species of this genus in the eastern United States has a distribution pattern in the north which is connected with the lower Great Lakes, specifically Lake Erie, and the lower Ohio River and Missouri River basins. Recent records of Euphyes dukesi suggest that the sole postglacial northern migration route was the Mississippi, Ohio, and Wabash River basins, with some diffusion of its range into the lower Missouri River basin. A continuing lack of any reports or records of colonies of Euphyes dukesi in the north and east of the Alleghanies supports this hypothesis.

This paper is also concerned with the Ohio and Michigan distribution of this skipper. It may be described as a "terminal" distribution pattern for this extremely localized and sedentary insect. Some field observations indicate that "micro-expansions" may still occur within its range.

DUKES' SKIPPER COLONY BECOMES OHIO STATE PARKS' FIRST NATURE SANCTUARY. Nancy Stranahan, Ohio Department of Natural Resources, Fountain Square, Columbus, OH 43224

Leland Martin's continuing pursuit of Dukes' Skippers took him to public and private lands alike. Leland discovered the Dukes' Skipper at Findley State Park in 1963, and an unusually large colony of Dukes' Skipper at Findley in 1972. The significance of the presence of Dukes' Skipper at Findley State Park emerged when Leland Martin, in 1981, wrote to the Division of Parks and Recreation, encouraging the consideration, proper management, and protection of the colony area. The importance of a letter to state government is often underrated. Official curiosity was greatly stirred by the correspondence. Not aware of the natural history of Euphyes dukesi, state park personnel sought out Leland Martin and Eric Metzler, who together explained the importance of the colony. Three goals emerged -- protection of the colony, enlightment of the state park personnel, and increased awareness of the public. Yet, as can be imagined, instilling an appreciation in people toward and 6-legged creature is always an uphill struggle. An eduational tool was needed to help. The final product of these discussions was the creation of Ohio State Parks' first nature sanctuary: The Dukes' Skipper Nature Sanctuary.

The results of the nature sanctuary are positive. Protection of the colony from unnatural disturbance is now assured, due to park management's enlightened awareness. With enlightenment has come a feeling of pride among Findley's park staff. An interpretive display for the park office, including Leland's mounts of Dukes' Skipper, was designed, and sanctuary entrance signs were ordered. News releases were sent out, eliciting a remarkable amount of publicity. Most importantly, the public has an added respect for the Dukes' Skipper Butterfly and insects in general. After all, if the State of Ohio named a sanctuary after an insect, they must be important!

THE CLEVELAND MUSEUM OF NATURAL HISTORY LEPIDOPTERA: THE COLLECTION, THE BIOLOGICAL RECORDS PROGRAM OF NORTHEASTERN OHIO, AND THE TAGGING OF MONARCHS. Sonja Teraguchi, The Cleveland Museum of Natural History, Cleveland, OH 44106

The Cleveland Museum of Natural History (CMNH) has about 15,000 Lepidoptera in its collection, mainly from Ohio and neighboring states, and it is an objective of the Museum to build this collection into a comprehensive regional collection for northeast Ohio. The development of the collection is a project in the Biological Records Program of Northeast Ohio (BRP/NEO). The BRP/NEO is a program of the Collections Division at the CMNH and is supported by the Gund and Reinberger Foundations. The computerization of specimen records is one of the goals of the BRP/NEO and the computerization of butterfly records began in April, 1983. Print-outs are available to qualified researchers. Lepidopterists are encouraged to participate in the building of this regional collection by donating specimens and by studying specimens already in the collection. Entomological research at the CMNH includes studies of the Monarchs of Kelleys Island, Ohio. Each September, several hundred adults aretagged and their movements studied. Lepidopterists can join this project by contacting the Museum in late August or early September.

THE DOS PASSOS CONNECTION. Bob Lee Mowery, Thomas Library, Wittenberg University, Springfield, OH 45501

Cyril F. dos Passos began the practice of law in the firm of dos Passos and dos Passos (his father and his uncle) in New York City in 1908. Twenty years later he retired from the law and began to pursue, literally, his long-time hobby: butterflies. In the next fifty years he amassed the finest library on Lepidoptera in private hands. The Library of more than 3000 volumes is the library of a working scholar. It includes complete runs of most journals in the field, all standard texts and many of the rarest books. In 1981 the collection was given to Thomas Library, Wittenberg University, Springfield, Ohio.

REFLECTIONS ON THE PROGRESS OF THE LEPIDOPTERISTS' SOCIETY AND NORTH AMERICAN LEPIDOPTEROLOGY. THE PRESIDENTIAL ADDRESS. Charles V. Covell, Jr., Department of Biology, University of Louisville, Louisville, KY 40208

Landmarks in the activities of The Lepidopterists' Society during the past 15 years are enumerated, with accompanying slides of officers, members, and places where annual meetings have been held. Progress in the activities of the Society, and high points of meeting and associated field trips are emphasized. Developments of the Society's publications, and contributions of the various editors and other contributors are mentioned. High points in Lepidoptera research during this period by various members of the Society are also discussed. Finally, comments are made on the future directions the Society might take, as seen from the viewpoint of the President.

BUTTERFLIES OF PENNSYLVANIA. John Prescott, 369 East Gore Road, Erie, PA 16509

A total of 146 species has been recorded from Pennsylvania including 27 species in addition to those reported by Tietz (1952). Of these, 119 species are known to be resident in the state. The southeastern counties probably have about 110 species; the other southern counties, about 90 species; and some of the northern counties may have no more than 70-80 species. A list of counties is presented with the number of known species, contributors of records, and published references. Also, an abreviated list of species is presented with distribution records, resident status, abundance, localization, flight period, adult food sources, and larval food plants.

LEPIDOPTERA IN THE PINE RIDGE, NEBRASKA. Clifford D. Ferris, Bioengineering Program, University of Wyoming, Laramie, WY 82071

The Pine Ridge is a small, isolated scarp-restricted relict conifer region in northwestern Nebraska. This region was collected many years ago by Leussler, and more recently by Kurt Johnson. Extensive collecting in 1982 verified some very old butterfly records for the area, and several new species for the region were found. Both the endemic butterflies and macro moths are a curious interblending of eastern and Rocky Mountain fauna. Some of the more interesting species are presented through the medium of color slides. Some of the butterflies to de discussed are: Asterocampa celtis, Phyciodes tharos (type B), and P. batesii (which are sympatric and synchronic), Speyeria aphrodite, Cercyonis pegala, Coenonympha tullia, and Oeneis uhleri.

CLADISTIC ANALYSIS AND VICARIANCE BIOGEOGRAPHY IN STUDIES OF LEPIDOPTERA. Eric L. Quinter and Kurt Johnson, American Museum of Natural History, Central Park West at 79th Street, New York, NY 10024

Cladistic analysis, a method based on Hennig's "Phylogenetic Systematics," has recently increased in preference and usage among taxonomists. A method for biogeography combining cladistics and Croizat's "Panbiogeography" has also been developed. We have noted in recent issues of The Lepidopterists' News an increasing interest in the subject, coupled with suggestions that these methods be explained. Recently, we provided a published paper concerning this in relation to the Ehrlich & Murphy/Miller & Brown controversy regarding North American butterfly nomenclature (in press, Jour. Res. Lep., as of March, 1983).

Cladistic analysis essentially differs from other methods by striving to group taxa by hypothetical kinship relations, not by overall similarity. Hennig's rationale and method for distinguishing unique characters used to estimate kinship is reviewed. The relations of cladistics to concepts of biological species, subspecies, and inter-breeding experiments are discussed.

According to Hennig and Croizat, there is a direct correlation between allopatric speciation and lineages of sister taxa; thus, relationships between diagrams of kinship relations and spatial relations will be examined. Vicariance biogeography of Nelson and Platnick are distinguished from that of Croizat. Plate tectonics are mentioned.

We summarize areas of Lepidoptera study where cladistic analysis and vicariance biogeography may be recommended. We comment on how the new methods may be viewed without undue concern over upsetting concepts or value of other methods which either group taxa on the basis of similarity or invoke dispersal mechanisms as explanations for spatial distribution.

HAMADRYAS IN THE UNITED STATES OF AMERICA. Dale W. Jenkins, Allyn Museum of Entomology, 3701 Bay Shore Road, Sarasota, FL 33580

Hamadryas are neotropical nymphalid butterflies known for many years as Ageronia. They have been misidentified frequently due to the many synonyms and errors in figures in most books and field guides. A critical revision of the genus has been just completed so that it is now possible to identify the Hamadryas of the United States. Based on an examination of about 9000 specimens and 53 types in 30 museums and collecting in 20 countries, of the 100 described taxa, 20 species and 21 subspecies are recognized.

Hamadryas which have been collected in the United States and reported in the Miller and Brown (1981) Catalogue and Checklist include: H. amphinome mexicana (Lucas) and H. feronia farinulenta (Fruh.). H. februa gudula (Fruh.) was included but should be changed to H. februa ferentina (Godart). These have all been collected in south Texas.

Three new additions to the United States list include H. amphichloe diasia (Fruh.) reported from the Florida Keys in the 1978 Field Summary as H. februa diasia (Fruh.). H. iphthime joannae Jenkins, is a newly described subspecies which has been collected in Burnet Co., Texas. H. guatemalena marmarice (Fruh.) was collected in Hidalgo Co., Texas.

Unsubstantiated misidentified specimens include "H. fornax" (Hubner) and "H. ferox" (Staud.) which were reported from Texas. These should be removed from the Miller and Brown list for the United States. "H. guatemalena" (Bates) was mistakenly reported from Texas by Godman & Salvin since they confused the name with H. eronia.

TAXONOMY, ECOLOGY, AND SEXUAL SALTATION IN MYSCELIA. Dale W. Jenkins, Allyn Museum of Entomology, 3701 Bay Shore Road, Sarasota, FL 33580

Myscelia is a genus of neotropical nymphalid butterflies that occur from Arizona, Texas, and Baja California to Argentina. Most species and subspecies occur in Central America and Mexico. They are often misidentified because of the problem of correlating the dimorphic males and females which have often been described as different species. For example, M. cyananthe males are locally common but the female has remained unknown for over 100 years. The female is now known due to finding it with the males in an isolated area, a gynandromorph, and a pair encopula. It is now possible to identify 16 species and subspecies.

The most primitive species occur in the lower Amazon valley. A phylogenetic sequence occurs northwestward in South America with addition of many white spots on the blue background of the forewings. There is a very interesting reversal of this sequence by a reduction of white spots and blue bars in two evolutionary lines. One line extends northwestward through Central America to Baja California until all white spots and blue bars are lost leaving only a basal purple area. This reduction sequence occurs in obvious saltations going back and forth between sexes like jumping hopscotch. In M. pattenia the males have the same pattern which is the same as in females of M. skinneri and M. streckeri. The males of M. skinneri have lost most spots, and males of M. streckeri isolated in Baja California have lost all white pattern. A similar loss of white pattern occurs in a series of four subspecies of M. cyaniris starting in Guyana and Venezuela and sequentially losing some spots to a reduced pattern in western Mexico.

THE IDENTIFICATION OF TWO SPECIES OF JUNONIA HUBNER (NYMPHALIDAE), J. EVARETE AND J. GENOVEVA, IN JAMAICA WITH THE ESTABLISHMENT OF NEOTYPES FOR BOTH SPECIES. T.W. Turner, Agri-Trade, Inc., 2582 Haas Avenue, Clearwater, FL, 33575 and J.R. Parnell, Department of Zoology, University of the West Indies, Mona, Kingston 7, Jamaica

The validity of the two species, Junonia evarete and Junonia genoveva originally described by Cramer from Surinam is reestablished and recognized in Jamaica. The relevant literature of this group is reviewed and the synonymy of these species is discussed. Since the original type specimens have been destroyed, neotypes for the two species have been designated. Morphological, behavioral, and chromosomal differences between the adults of the two species are discussed, and notes on the life histories and immature stages are included.

REINTHAL'S ASTEROCAMPA. Tim Friedlander, Department of Entomology, Texas A & M University, College Station, TX 77843

Dr. Walfried J. Reinthal's collection of the hackberry butterflies (Nymphalidae: Asterocampa), now a part of the Carnegie Museum of Natural History's holdings, is available for study. Dr. Reinthal passed away in 1982 leaving what surely is the largest single collection of the genus, close to 3500 adult specimens, the majority of which were reared. His preoccupation with the group spanned three decades with the most intensive work being done in the late 1950's. Dr. Reinthal travelled extensively in the continental United States and West Indies in search of hackberry butterflies and their immature stages. Although he never put a revision of the genus in print, his experience with the organisms compelled other authors to use his expertise in treatments of North American butterflies. Through his field notes, manuscripts, and correspondence, it has been possible to reconstruct and document the history of Dr. Reinthal's knowledge of Asterocampa and pay tribute to one of America's lesser known lepidopterists.

PHENOTYPIC DIVERGENCE AND GENE FLOW IN BLENDING POPULATIONS OF LIMENITIS (BASILARCHIA) ARTHEMIS--ASTYANAX IN THE NORTHEASTERN UNITED STATES OF AMERICA. Austin P. Platt, Department of Biological Sciences, University of Maryland Baltimore County, 5401 Wilkens Avenue, Catonsville, MD 21228

A well-documented north-south zone of intergradation between Limenitis (Basilarchia) arthemis arthemis Drury and Limenitis arthemis astyanax Fabricius extends across the northeastern portion of the United States and southern Ontario from New England to southeastern South Dakota. Within this blend zone, butterflies of intermediate phenotypes are common, and they exhibit the full range of variability between the two parental extremes. Northern arthemis possesses broad medial white bands (a presumed disruptive color pattern) whereas, southern astyanax is unbanded, having instead wide patches of dorsal hindwing blue-green iridescence, and conspicuous red-orange marginal spots on the ventral surfaces of the hindwings. This form is considered to be a Batesian mimic of the unpalatable Troidine swallowtail, Battus philenor Linnaeus with which it is widely sympatric.

Admiral butterflies with intermediate color patterns are referrable either to form proserpina Edwards, which is common and variable, or to form albofasciata Newcomb, which is fixed and rather scarce. Platt and Brower (1968) have shown that intergrading populations of these insects conform to theoretical expected Hardy-Weinberg frequencies across the blend zone in New England, suggesting that mating is random, and that no "net" selection is occurring at single localities within the steep cline of phenotypic reversal.

These early findings have been confirmed by examination of random samples of butterflies taken in western Maryland, central Pennsylvania, central Wisconsin, and eastern South Dakota, all of which seem to conform to the appropriate theoretical Hardy-Weinberg expected frequencies. Butterflies in this complex illustrate the fact that phenotypic divergence can occur independent of gene flow in such clinal situations.

PRONOPHILINI (SATYRIDAE) OF MEXICO. Lee D. Miller, Allyn Museum of Engomology, 3701 Bay Shore Road, Sarasota, FL 33580

The trip Pronophilini is Andean with outlying populations found in other areas. The nine Mexican species are members of six genera, only one of which is found in the United States. These species and subspecies are illustrated and their ranges and ecological associations are elucidated.

THE SYSTEMATIC POSITION OF THE NAMED NORTH AMERICAN FORMS OF BOLORIA (CLOSSIANA) TITANIA AND BOLORIA (CLOSSIANA) CHARICLEA (LEPIDOPTERA: NYMPHALIDAE). Ted Pike, Department of Entomology, University of Alberta, Box 1231, Fairview, Alberta TOH-1LO

Series of adult male specimens of nominate (European) and named North American subspecies of Boloria (Clossiana) titania and Boloria (Clossiana) chariclea were examined for 28 genitalic and 11 wing pattern characters. No characters were found which supported the current classification. Five characters indicate that all North American subspecies are more similar to nominate B. chariclea than nominate B. titania. No characters indicated differentiation at the species level. No characters indicated affinities closer to B. titania than B. chariclea.

MOVEMENT AND DISPERSAL IN EUPHYDRYAS GILLETTII (NYMPHALIDAE). Ernest H. Williams, Department of Biological Sciences, Wellesley College, Wellesley, MA 02181

Euphydryas gillettii is an uncommon butterfly which occurs in isolated populations in the Rocky Mountains from Wyoming to Alberta. Though there is little dispersal outwards from these pockets of concentration, some does occur, with roughly three percent of all females moving outside the population boundaries each day. Males fly more often and more strongly within the population than females but disperse less. To help understand why such a population structure exists for this species, in 1982 I evaluated the influence of two underlying resources on patterns of distribution and movement in a population in northern Wyoming. Experimental reductions of nectar sources, a white Geranium and several yellow species of Senecio, and of the oviposition substrate, the shrub Lonicera involucrata, were made in selected quadrats by cutting half of the flowering stems and by covering half of the Lonicera with dyed cheesecloth. The distributional patterns of egg masses and adults were then compared with the same patterns observed in 1981 when there were no manipulations. Where the abundance of nectar was reduced, there were significantly fewer observations of females as well as fewer egg masses. Where the availability of the host shrub was reduced, there were significantly fewer egg masses but significantly more observations of females. The latter result probably reflects greater movement back and forth within the population boundaries. Oviposition substrate is the most important factor affecting distribution and movement, but the abundance of nectar is also significant. These two resources occur together most abundantly in moist, open areas of secondary growth, characteristics which best define the habitat. Because all the resources needed by the adults are found superimposed in such habitats, there is little need for much movement by the adults and thus no selective value for greater dispersal tendencies. As a result, the adults are quite sedentary, and the species occurs in isolated populations, infrequently colonizing empty habitats. These results are unexpected for a species of successional habitats but may explain the limited range of E. gillettii.

THE INFLUENCE OF BIRD PREDATION ON BUTTERFLY POPULATIONS. M. Deane Bowers, Museum of Comparative Zoology, Harvard University, Cambridge, MA 02138**

The role of predation in the evolution of lepidopteran wing color and pattern is widely assumed. In the checkerspot butterfly, Euphydryas chalcedona (Nymphalidae), the wing coloration and pattern may vary extremely within as well as between populations.

At one population of this species, over 400 detached wings resulting from bird predation were found. These wings comprised well over 200 individual butterflies, and represented a sample of successfully attacked and killed individuals. During the course of a mark-release-recapture study, a sample of almost 300 live butterflies had been photographed in the field before being released back into the population. This sample of live butterflies included both intact individuals, as well as some that showed evidence of attack by birds.

Characteristics of this photographed sample of live butterflies from the field were compared with those of the individuals that had been successfully attacked and killed as evidenced by their abundant remains. This analysis showed that birds directed their attack towards particular subsections of the population: 1) towards females, which in E. chalcedona are seldom encountered by human predators, but which made up well over 50 percent of the sample of detached wings; and 2) among males, towards the red individuals.

The results of this study are compared with others of predation on butterfly populations, and some of the effects of such predation are discussed.

**The work discussed in this paper was done in collaboration with Irene Brown and Darryl Wheye (Stanford University) and Diane Wiernasz (Princeton University).

THE STARTLE RESPONSE OF BLUEJAYS TO CATACOLA (NOCTUIDAE) MODELS. Debra H. Schlenoff, Department of Zoology, University of Massachusetts, Amherst, MA 01003

Artificial moth models were presented to caged blue jays, Cyanocitta cristata, in order to investigate the effectiveness of deimatic displays in underwing (Catocala: Noctuidae) moths. The models had flexible, patterned "hindwings" which were concealed behind cardboard "forewings" until the birds removed them from a presentation board. The kinds and frequencies of hindwing patterns were varied and the responses of the jays were observed and scored.

Jays which had been trained on models with gray hindwings exhibited a startle response when they were exposed to Catocala-patterned hindwings. In contrast to this, subjects trained on Catocala models did not startle to a novel gray hindwing. The startle response to Catocala patterns lasted over several days until birds habituated to the models. When the jays had habituated to one Catocala hindwing pattern, a novel Catocala pattern always elicited a startle response. Familiar Catocala hindwing patterns which appeared in an anomalous context (i.e., associated with a different forewing pattern) also evoked a startle response from these birds.

Novelty, oddity, conspicousness, and anomaly are considered as possible stimulus characteristics which trigger the startle response.

PREDATOR-PREY INTERACTIONS: EFFECT OF PHYSICAL CONSTRAINTS OF CATERPILLAR DEFENSIVE BEHAVIOR. Nancy E. Stamp, Department of Zoology, University of California, Davis, CA 95616

The behavioral interactions of caterpillars and insect predators were examined in the framework of a model addressing the consequences of physical contraints of caterpillar defensive behavior. When a predator cannot overwhelm a caterpillar, the caterpillar may defend itself rather than try to escape. The typical caterpillar attaches firmly to the substrate with the prolegs, lifts the thoracic legs and swings the anterior of the body toward the attacker. Depending on the species and larval age, caterpillars may: 1) use their bodies to hit and knock away attackers, 2) use their mandibles to grasp the attacker's legs or antennae and then fling the attacker away, or 3) regurgitate or wipe offensive glands on the attacker. Caterpillars can defend themselves effectively and may even injure attackers, at least temporarily.

The premise of the model is that by moving only the front half of the body, a caterpillar defends a limited space around itself (to the sides and over its back). This means that the space it cannot defend well (some portion of the rear end) is particularly vulnerable to insect enemies. Thus, the types of defensive behavior employed by a caterpillar, the attack behaviors of enemies, the sequence of attack behaviors exhibited during a predator-caterpillar interaction and the outcome of the event should reflect the maximal defendable space of a particular caterpillar. For example, an insect predator that cannot overwhelm a caterpillar is expected, once contact is made, to orient to the most vulnerable portion of the caterpillar and concentrate attacks here.

Using measurements of body diameter and the moving (defending) portion of a caterpillar relative to total length, maximal defendable space was estimated for several species of caterpillars. The effect of cuticular elongation on maximal defendable space was considered as well because this elongation allows cuticular adjustment (i.e. stretch of the outer bending surface) to accomodate the incompressible body volume. Maps of the maximal defendable space indicated where these caterpillars were most vulnerable to attack by insect enemies. Then attack behavior of predators was monitored relative to the actual space defended by the caterpillars. By focusing on the mechanisms of successful defense by caterpillars and successful attack by their insect enemies, this study provides data that can be incorporated into basic predator-prey interaction models and, thus, increase the predictive powers of such models.

MULTIPLE MATING AND SPERM COMPETITION IN LEPIDOPTERA. Boyce A. Drummond, Department of Biological Sciences, Illinois State University, Normal, IL 61761

This paper explores the relationship between mating frequencies of Lepidoptera in natural populations and the evolution of male and female courtship strategies as influenced by the mechanical and physiological constraints on sperm transfer, storage, and competition within the female. Mating frequency in females increases with age and is greater in long-lived tropical species than in their more ephemeral temperate counterparts. Furthermore, among long-lived tropical butterflies, species that lay eggs singly mate more often than species that oviposite in large clutches. Because mating frequency affects the rate at which genetic factors can be shuffled in populations, these findings suggest that important relationships exist between courtship behavior, mating frequency, and the evolution of life history characteristics in Lepidoptera. Sperm competition implies that viable sperm from more than one male are present in the female's reproductive tract at one time, a condition that has been confirmed for all multiply-mated Lepidoptera studied. Because male Lepidoptera invest considerable energy in a single act of mating (the spermatophore transferred by the male to the female is rich in protein and lipids), there is strong selection on males to insure that their sperm fertilize most of the eggs in a multiply-mated female. Male Lepidoptera exhibit a variety of post-copulatory guarding techniques, including the formation of mating plugs (sphraga), the passage of chemical substances that inhibit female courtship receptivity, and the transfer of anti-aphrodisiac pheromones that repel subsequent courting males. A new hypothesis based on my research is that the extraordinarily long duration of copulation in Lepidoptera (often measured in hours) is, in fact, a type of post-copulatory guarding of females by males. Because successful insemination depends not only on the formation in the female of a spermatophore, but also on the subsequent migration of the sperm from the spermatophore to the spermatheca, males are under selection to prolong the copulatory act until sperm migration is complete. Should a second male mate with the female before this migration is complete, it is the second male's sperm that fertilize all the eggs because the second spermatophore displaces the first.

PUPAL COLOR DIMORPHISMS IN SWALLOWTAIL BUTTERFLIES. David A. West, Department of Biology, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061

Some swallowtail species are flexible in pupal development and can produce either green or non-green ("brown") pupae. The determination of pupal color in these species depends on the interplay of 1) the genotype of the individual, since there is quantitative genetic variation in the propensity of individuals to produce green or brown pupae; and 2) the substrate on which the individual pupates, since color and texture, among other factors, affect the expression of the genotype. The usual result of the interplay is that pupae are cryptic on their natural pupation substrates, and that genetic variation in the propensity is maintained. Different species place different emphasis on such cues as color and texture, and they also differ in the time of day at which they evacuate the larval gut and start wandering to a pupation site. At some time during that prepupal wandering the larva passes through a period when it detects the relevant cues for pupal color determination - the sensitive period.

Alastair Smith suggested that species which start wandering late in the day, and may therefore pass the sensitive period at night, might use predominantly textural cues for pupal color determination, while those that evacuate early in the day would use chiefly color cues, but the exact timing of the sensitive period itself has been unknown for any species. Experiments on this question in several North American species are described, and it is shown that in at least one dimorphic species (Eurytides marcellus) individuals can delay the sensitive period overnight and will not make the pupal color decision in the dark. The conclusion is that in some species, at least, the relative emphasis on texture and color as cues for pupal color determination depends on the nature of the preferred pupation sites rather than on the timing of the events preceding pupation.

RATES OF SPECIATION IN EUMAEINE HAIRSTREAKS (LYCAENIDAE). Robert K. Robbins, Department of Entomology, NHB 127, Smithsonian Institution, Washington, DC 20560

Eumaeine hairstreaks (Lycaenidae) have apparently speciated rapidly. They represent 10 percent of the World's true butterfly fauna, but are remarkably similar morphologically. Further, their specialized morphology indicates that they arose recently compared with other hairstreak tribes. According to ecological theory, rapid speciation is correlated with ecological specialization. I first compared eumaeines with other groups of butterflies and found that this prediction does not appear to be true. I then compared lineages within the eumaeine genus Atlides, and preliminarily conclude that rate of dispersal is the most important predictor of speciation rate. Many more generic revisions will be needed before the importance of other factors can be assessed.

BIOLOGICAL RELATIONSHIPS AMONG WESTERN SPRUCE BUDWORMS: A PARADOX FOR THE SPECIES CATEGORY IN TAXONOMY. J.A. Powell and J.A. DeBenedictis, Division of Entomology/Parasitology, University of California, Berkeley, CA 94720

Four conifer-feeding Choristoneura (Tortricidae) species are in part sympatric in various parts of the southwestern United States. Three are Abietoideae-feeders: C. retiniana on Abies has unpigmented larval integument and weakly pigmented pupal integument (appearing green in life) and has two distinct color phases in moths of both sexes. C. carnana in California and C. occidentalis in Nevada and Utah feed on Pseudotsuga when sympatric with retiniana, possess heavily pigmented larvae and pupae (red-brown), and their adults are not polymorphic. Another species, C. lambertiana, feeds on Pinus and is sympatric with one or two of the Abietoideae-feeders in many areas. The flight periods of sympatric pairs are synchronous. Trapping with virgin females and synthetic pheromones indicates virtually 100 percent separation in attraction of males, evidently the primary factor in reproductive isolation. At the northern end of its range, near the Oregon border, however, retiniana loses its distinctness, and populations in southern Oregon and northward encompass the full range of morphological and pheromone chemistry of both California Abietoideae-feeders. Populations do not segregate by host tree genus, comprising the variable entity called C. occidentalis. Thus, species defined by any conventional concept in California and Utah cannot be distinguished by the same criteria in the Pacific Northwest.

THE SPRUCE BUDWORM (CHORISTONEURA OCCIDENTALIS FREEMAN: TORTRICIDAE) PROBLEM IN THE WESTERN UNITED STATES OF AMERICA. Karolis Bagdonis, R.D. 2, Box 67, Highway 30, Laramie, WY 82070

The western spruce budworm (Choristoneura occidentalis Freeman: Tortricidae) is western North America's most devastating coniferous forest defoliator. The range of C. occidentalis covers the forested areas of the Rocky Mountain states from Arizona and New Mexico to Oregon and Washington and into southern British Columbia. The western spruce budworm feeds especially on firs and spruces, including Douglas, grand, white, balsam, and subalpine firs; Engelmann and blue spruces; and western larch. Only in the past sixty years have budworm problems been noted in the Rocky Mountain states. From 1920 until 1948, only several periodic, isolated outbreaks and minor infestations occured in the West, particularly in Colorado. The first major outbreak started in 1948 and, by 1952, occidentalis had spread to over two million acres. This outbreak, with periodic rises and falls in populations, has continued to the present time, with another epidemic starting in 1978. By 1982, nearly 4.9 million acres were heavily infested in the West, with infestations increasing about 100,000 acres per year. Gross infested acreage, over the past thirty years, totals over 10 million acres. The current epidemic, totally out of control, is estimated will last another 8-10 years. The Bagdonis Flying Circus, or B.F.C., is currently involved in a massive research project to study the highly variable western spruce budworm and its native dipteran and hymenopteran parasitoids throughout the West. Regionally specific lists of parasitoids will be complied over 3-5 years in the hope of finding 4-6 major parasitoids in each area which might be appliable for mass rearing programs for use in future control.

THE MIGRATION OF SPRUCE BUDWORM MOTHS (LEPIDOPTERA: TORTRICIDAE) IN ATLANTIC CANADA. D.O. Greenbank, G.W. Schaefer, R.C. Rainey, and A.W. Thomas, Canadian Forestry Service, P.O. Box 4000, Fredericton, New Brunswick E3B 5P7

Between 1970-1976 an intensive study of the migration of budworm moths was conducted by the Canadian Forestry Service under the leadership of D.O. Greenbank (now retired). This talk briefly outlines the various techniques used to study the migrants during the three phases of migration, viz: emigration, displacement in the air space, immigration into a forest stand. Techniques used included: observation platforms, night-viewing telescopes, radars (both ground and air-borne), aircraft with insect nets, light traps and various meteorological equipment. The entomological information obtained included moth altitude, orientation, duration of flight, air speed, distance travelled, sex ratios, fecundity, and mating status of the dispersers.

OBSERVATIONS ON THE MATING BEHAVIOR OF THE ADULT MIMOSA WEBWORM, HOMADAULA ANISOCENTRA MEYRICK (LEPIDOPTERA: GLYPHIPTERYGIDAE). John W. Peacock, Forest Service, United States Department of Agriculture, 359 Main Road, Delaware, OH 43015

Studies on the mimosa webworm, Homadaula anisocentra Meyrick, have provided new information concerning mating behavior, pheromone production, and sex attraction in this insect, a serious pest of ornamental honey locust and mimosa. Under controlled laboratory conditions (23-25°C, 40 percent relative humidity, and a 16-8 hour light-dark cycle), calling by virgin females begins with five minutes of light on and continues for an average of 50 minutes. Unmated females call at least once per day for a period of greater than three weeks when sustained with daily feeding on a eight percent dextrose solution. Properly conditioned male moths will respond to caged, calling virgin females by flying upwind in a wind tunnel following release at the end of the tunnel opposite the female. In the field, wild male moths respond to caged virgin females during the morning crepuscular period. Extracts containing volatiles produced by virgin female moths are attractive to males in both the lab and field.

EXCEPTIONAL CATCHES OF CATOCALA AT ELMS INFECTED WITH DUTCH ELM DISEASE. John W. Peacock, Forest Service, United States Department of Agriculture, 359 Main Road, Delaware, OH 43015

During the period 28 July - 14 September, 1980, 21 species of Catocala were collected at sap flowing from wounds produced by the feeding of elm bark beetles (Scolytus multistriatus) on the trunks of American elms (Ulmus americana). The elms demonstrated symptoms of Dutch elm disease. Up to 40 moths were sighted on certain nights, while few or no Catocala were seen at the same time on trees painted with sugar bait or at bait-soaked sponges no more than 30 meters from the attractive elms. Only a few diseased elms observed since 1980 have been attractive to Catocala, and these were much less attractive than the original trees. It appears that a certain combination of factors--involving the condition of the diseased elm at the time of beetle attach--is responsible for the flow of attractive sap and the subsequent attraction of the moths to the trees.

MELANISM IN PHIGALIA TITEA (CRAMER) (GEOMETRIDAE): A SIXTEEN-YEAR RECORD FROM CENTRAL MASSACHUSETTS. Theodore D. Sargent, Zoology Department, University of Massachusetts, Amherst, MA 01003

Phigalia titea have been sampled at various light sources at a single location in Leverett, Franklin Co., MA for the past 16 years (1968-1983), and a number of experiments involving the background choices of these moths have been carried out over that period. This report summarizes the results of these effects.

The melanic morph, "deplorans," has comprised about 20 percent of the more than 4000 specimens taken, and the three light sources utilized (incandescent, flourescent, and mercury vapor) have yielded closely similar estimates of this melanic frequency. There have been no discernible, long-range trends of either increasing or decreasing levels of melanism over the 16-year period. However, two significant temporal effects have been detected: 1) a decline in melanic frequency late at night (after 2300 hrs.); and 2) an increase in melanic frequency over the second half of the flight season.

Various experimental tests of background preferences have revealed no behavioral differences between the typical and melanic morphs. These results are compared with results obtained with other species, notably Biston betularia L. in England.

The implications of these P. titea findings are briefly discussed with reference to general ideas on industrial melanism.

QUESTIONS RAISED BY CONSIDERATION OF PROTECTIVE COLORATION AND MIMICRY AS ISSUES IN TRANSMISSION OF INFORMATION FROM PREY TO PREDATOR. Benjamin H. Landing, University of Southern California and Department of Pathology, Childrens Hospital of Los Angeles, 4650 Sunset Boulevard, Los Angeles, CA 90027

"Protective coloration" transmits "disinformation" to potential predators. Protective patterns of butterflies can confer resemblance to objects not of interest to predators, e.g. leaves, twigs, grass, bark, etc. (A properties) or to toxic or distasteful species (B properties). Since A properties involve unrecognizability and B properties, recognizability, they are to some extent contradictory, and the sum of A + B can be increased only by emphasizing one or the other (on the same wing surface). The concept of Muellerian mimicry suggests that a protected species, or its mimic should benefit by having similar color patterns on both wing surfaces. Is the inverse, that species with similar patterns on both surfaces are more probably protected, or mimics, valid? Similarly, protected species should benefit by the same color pattern in both sexes (= intraspecific Muellerian mimicry). Is the inverse, that nondimorphic species are more probably protected, or mimics, valid? In mimicry complexes, nondimorphic species should more probably be models, and dimorphic species more probably mimics. This does appear true.

UNUSUAL BEHAVIORAL PATTERNS IN NOCTUID LARVAE. Roy W. Rings, Department of Entomology, Ohio Agricultural Research and Development Center, The Ohio State University, Wooster, OH 44691

Climbing cutworms are serious pests of tree fruits in midwestern orchards. The nocturnal activity and feeding behavior of the spotted-sided cutworm, Agrotis badinodis Grote in Ohio and Barnes' climbing cutworm, Abagrotis barnesi Benjamin in Michigan are discussed. Reversal of this behavior is exemplified by Morrison's cutworm, Eupsilia morrisoni Grote. A motion picture film of the swimming behavior of the yellow water lily borer, Bellura gortynoides Walker, is presented.

INTEGUMENTAL STRUCTURE OF MICROPTERIGID LARVAE WITH SPECIAL REFERENCE TO PLASTRON SURFACES. Donald R. Davis, Department of Entomology, NHB 127, Smithsonian Institution, Washington, DC 20560

Examination of the larval integument of Micropterigidae with the scanning electron microscope has revealed a number of interesting and sometimes puzzling morphological features. Some of these structures are useful in defining the family, particularly in distinguishing it from the recently described Heterobathmiidae from Patagonia. One of the most interesting structures to be discovered involves what is proposed to be a plastron surface, the first to be found in larval Lepidoptera. The plastron of certain Micropterigid larvae consists of thousands of microscopic columnar projections discernible at magnifications usually above 15000X. Collectively these structures are believed to assist in respiration by helping to maintain a thin air film over much of the integument while the larva is partially immersed in water.

CARDENOLIDE FINGERPRINTING OF THE MONARCH BUTTERFLY TO ITS MILKWEED FOOD PLANTS. Lincoln P. Brower, Department of Zoology, University of Florida, Gainesville, FL 32611

There are 108 known milkweed (Asclepias) species in North America which apparently can all serve as larval foodplants of the monarch butterfly (Danaus plexippus). Most milkweeds contain an array of poisons known as cardenolides (cardiac glycosides) which when stored by monarch caterpillars furnish defense against predation by various vertebrates, particularly birds. Each species of milkweed contains several different cardenolides and these can be visualized on a thin layer chromatography plate.

While not all milkweeds have distinct arrays of these chemicals, many do and adult monarchs reflect the differences. They, therefore, can be chemically fingerprinted to the species of milkweed that their caterpillars ate in the wild. By analysing fingerprint patterns of migrating or overwintering butterflies, it is possible to determine which milkweeds monarchs ate and thereby to gain insight both into their geographic origins and into the degree to which they are chemically protected.

The cardenolide fingerprints of western monarchs differ from those of the eastern population, and evidence is presented which suggests that massive predation by birds in Mexican overwintering areas is a consequence of human-made shifts in the relative abundance of milkweeds in eastern North America.

LEPIDOPTERA THAT USE OXYDENDRUM ARBOREUM (L) AS A FOOD PLANT. Eric H. Metzler, Ohio Department of Natural Resources, Fountain Square, Columbus, OH 43224

Since 1976, ova and larvae of Lepidoptera have been collected on Oxydendrum arboreum (L), also known as sourwood or sorrel-tree. Oxydendrum arboreum, a deciduous tree in the family Ericaceae, ranges from Florida and Louisiana north to Pennsylvania, Ohio, and Indiana. In Ohio, it reaches its northernmost distribution south of Columbus in the unglaciated territory. Sourwood is found in acid soils and can quickly become established as an early successional tree in disturbed areas.

Most of the research has been conducted in an area of less than 10 acres in Vinton County, Ohio. Specimens of sourwood have been searched for larvae and ova, which were collected and reared on sourwood.

An Index to the Described Life Histories, Early Stages and Hosts of the Macrolepidoptera of the Continental United States and Canada by Harrison M. Tietz, 1972, lists six species of Lepidoptera associated with sourwood. Five of the six species listed by Tietz have been observed in this research, and an additional 31 species from 15 families are reported. This research is not restricted to the macrolepidoptera.

All specimens are in the private collection of the author. Following is a list of species reared: Sphingidae, Deidamia inscripta; Apatelodidae, Apatelodes torrefacta; Lasiocampidae, Phyllodesma americana, Malacosoma disstria; Saturniidae, Citheronia regalis, Automeris io, Actias luna; Arctiidae, Halysidota caryae, Halysidota tessellaris, Hyphantria cunea; Noctuidae, Acronicta impleta, Polia distincta, Lithophane unimoda, Jodia rufago, Pangrapta decoralis; Notodontidae, Datana drexelii, Schizura ipomoeae; Lymantriidae, Dasychira obliquata, Orgyia leucostigma; Geometridae, Nemoria mimosaria, Melanolophia canadaria, Ectropis crespuscularia, Campaea perlata, Probole amicaria, Eutrapela clemataria, Prochoerodes transversata; Eucleidae, Sibine stimulea, Euclea delphinii, Adoneta spinuloides; Megalopygidae, Megalopyge crispata; Olethreutidae, Zomaria interruptolineana; Tortricidae, Amorbia humerosana, Sparganothis distincta, Pandemis limitata, Argyrotaenia velutinana; Gelechiidae, Dichomeris ligulella; Oecophoridae, Machimia tentoriferella.

OBSERVATIONS ON AN OAK-FEEDING POPULATION OF HEMILEUCA LUCINA HY. EDW. (SATURNIIDAE) IN MASSACHUSETTS. William D. Winter, Jr., Harvard University, 257 Common Street, Dedham, MA 02026

A colony of Hemileuca lucina in Norfolk County, Massachusetts, has a September flight period coincident with that of the usual Spirea-feeding populations elsewhere in eastern Massachusetts; the females, however, oviposit freely both on Quercus species and on Spirea latifolia. First instar larvae from either oviposition choice thrive and mature on both food-plants. Comparisons are made with Hemileuca maia, an oak-feeding species which occurs only 30 miles to the southeast.

THE STATUS OF PAPILIO HOMERUS FABRICIUS IN JAMAICA, WEST INDIES. T.W. Turner, Agri-Trade, Inc., 2582 Haas Avenue, Clearwater, FL 33575

Papilio homerus Fabricius is endemic to Jamaica. The insect formerly inhabited the central forests of the island from the John Crow Mountains in the east to the Cockpit Country in the west in what appeared to be one continuous population. There are now two small populations each of which is threatened by destruction of the habitat. The immature stages and conservation measures are discussed.

INTERSPECIFIC VARIATION IN THE STRUCTURE OF SULPHUR BUTTERFLY COURTSHIP AND THE EVOLUTION OF MALE COURTSHIP DISPLAYS. Ronald L. Rutowski, Department of Zoology, Arizona State University, Tempe, AZ 85287

Three small sulphur butterflies (Eurema daira, E. lisa, and Nathalis iole) occur sympatrically throughout much of their respective ranges. Observations and film records of interactions between males and virgin females show that the courtships of these species vary with respect to the displays performed by the males. In particular, E. daira and N. iole males perform species specific displays unlike anything observed in E. lisa. Males of E. daira perch next to perched females and perform a wing-waving display while those of N. iole assume a stationary wings-spread posture in front of a perched female as part of their courtship. The behavioral differences between these species are discussed and evaluated relative to several evolutionary hypotheses in attempt to explain this diversity in male courtship displays.

ART MEETS SCIENCE: BUTTERFLIES IN THE HISTORY OF ART. Irving L. Finkelstein, Art Department, Georgia State University, 425 Springdale Drive, N.E., Atlanta, GA 30303

Although, sad to say, none of the most celebrated painters, sculptors, or architects are known to have been active lepidopterists, the image of the butterfly and moth is one of surprisingly frequent occurrence in the visual arts over the last 500 years, in a great variety of guises, and with an equally great diversity of meaning. Aside from the illustration of butterflies for specifically scientific purposes, the butterfly has appeared in paintings, scuptures, etchings, textiles, Bibles, and other illuminated manuscripts, jewelry, and more recently as an eye-catching device in advertising design.

It is obvious that the infinite variety in the shapes, patterns, and colors of the wings of Lepidoptera make these insects a natural for decorative design, and indeed they were used as such for centuries along with flowers, sea shells, fish, and other natural forms in the marginal framework of medieval religious manuscripts and later, in Dutch 17th Century still-life painting, as well as in Chinese scrolls and textiles. The specimens range from completely abstracted, stylized flights of the designers' fantasy to specific minutely detailed depictions, immediately recognizable as Papilio machaon, Pieris rapae, Vanessa atalanta, etc., and virtually as correctly reproduced as, say, those in the paintings of William Howe today.

The purposes and meanings of butterflies in art have been as diverse as the species themselves. Butterflies have been included in depicitions of heaven and of hell, as the personification of the human soul (Psyche=soul=butterfly, in Greek), and as symbols of fortune and of inconstancy. One American artist, James McNeill Whistler, even designed a stylized butterfly, which he used as his signature in nearly all of his paintings. Another American, Abbot Thayer, a very fashionable portrait painter, was seriously concerned with animal coloration and mimicry, and painted many sensitive, realistic depictions of Lepidoptera larvae in their natural setting.

This paper attempts to survey briefly the varied forms and functions of butterflies in the history of art and to demonstrate that artist and lepidopterist have, unknown to each other, furthered the scientific and aesthetic causes of lepidopterology.

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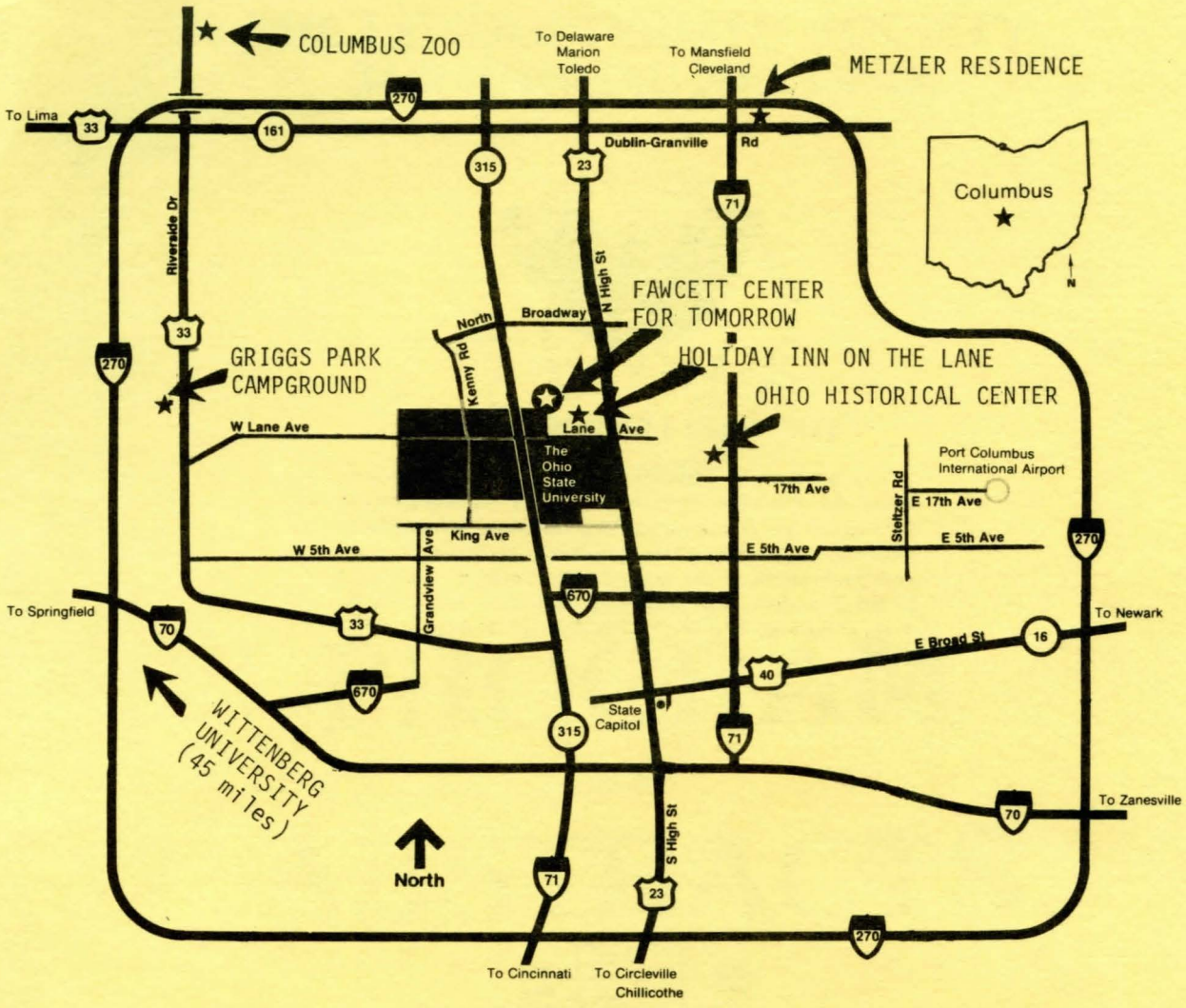
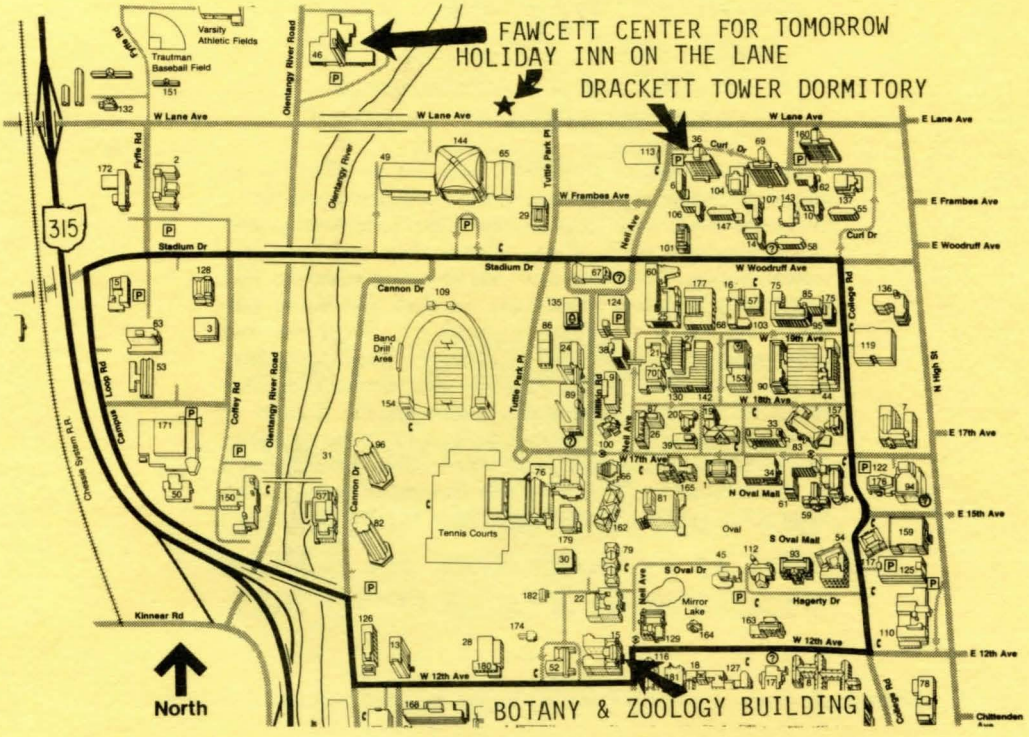
Charles C. King, Editor of the Program and Abstracts
Executive Director
Ohio Biological Survey





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THE OHIO LEPIDOPTERISTS

The purpose of THE OHIO LEPIDOPTERISTS is to encourage interest in, provide information on, and increase the knowledge of the butterflies, skippers, and moths in Ohio and neighboring states. Inquiries concerning programs and publications of the organization should be addressed to the President, The Ohio Lepidopterists, c/o Ohio Biological Survey, 484 West 12th Avenue, Columbus, Ohio 43210.

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