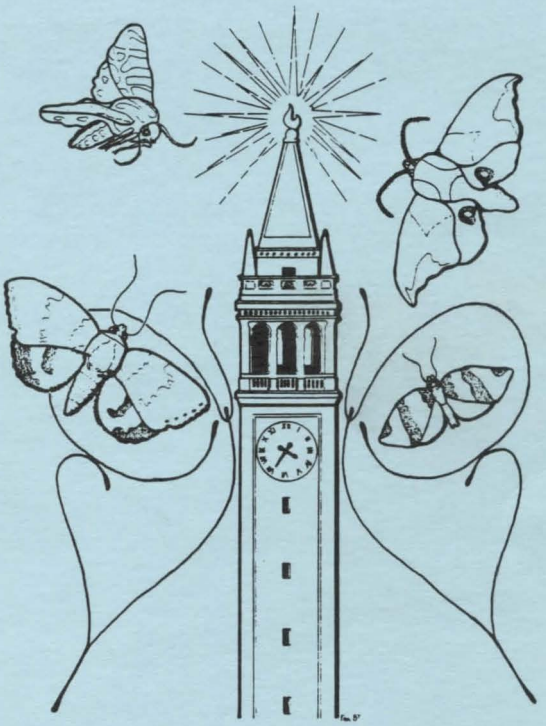
THE LEPIDOPTERISTS' SOCIETY

38th Annual Meeting



University of California, Berkeley

June 25–28, 1987

Welcome to the 38th Annual Meeting of the Lepidopterists' Society and to the University of California, Berkeley.

The Berkeley campus is the oldest of the nine-campus University of California system, located on a range of hills overlooking San Francisco Bay. The campus--home to about 30,000 students and 1600 faculty--is large and scenic. The surrounding areas are typical student neighborhoods, with numerous shops, restaurants, churches, and student housing. Renown for the excellence of its faculty scholarship and the diversity of its students, Berkeley is also known for student activism and for the progressive politics of the city in which it is located. All these characteristics combine to lend a uniquely wacky, cosmopolitan flavor to the community.

The Essig Museum of Entomology is located in Wellman Hall, on the north side of campus. The Thursday Executive Council meeting will be held in 133 Giannini Hall, next door to Wellman. Symposia and contributed paper sessions will be held in the Life Sciences Building and Dwinelle Hall, in the central part of campus.

AIRPORT TRANSPORTATION TO BERKELEY

The Bay Area Shuttle Service runs from both Oakland and San Francisco airports to Berkeley. It stops at the Berkeley House Motel, the Shattuck Hotel, and the Durant Hotel, which is next door to the Unit I Residence Halls. The cost is $10/adult, $8/child. Be sure to make reservations ahead (800-345-8687; 415-873-7771).

Other airport transit options: From Oakland airport, you can take the Oakland Air-BART shuttle to the Coliseum BART station for $1. BART fare to downtown Berkeley is $1.15. From San Francisco airport, you can take the Airport Connection limo service, which stops at the Durant Hotel ($12; 800-AIRPORT or (415) 841-0150). The San Francisco Airporter ($6; 415-788-2278), runs every 15 minutes to the downtown San Francisco terminal near the Powell Street BART station ($1.80 to the Berkeley station).

REGISTRATION

Registration will be held from 11 am to 5 pm on Thursday, June 25, 1987, at the Unit I Residence Halls, 2650 Durant Avenue.

Guides to local collecting sites and northern California entomological collections will be available, as well as a list of local restaurants, sightseeing suggestions, and a map to the campus and to the Thursday evening open house. You can purchase tickets to the barbeque and banquet at that time, if you have not already done so.

RESIDENCE HALL CHECK-IN

Those who opted for the Residence Hall package will be housed in the Unit I Residence Halls (tentatively assigned to Freeborn Hall), 2650 Durant Avenue, Berkeley.

You can check into the residence halls in the lobby area of Freeborn Hall from 11 am to 5 pm on June 25. Conference Services staff will distribute room keys and meal cards. If you arrive after 5 pm, call the telephone number posted outside Freeborn Hall for late check-in. Check-out time is 1 pm, Sunday, June 28. There will be no reduction in price for late arrivals, early departures, or missed meals.

Linen and towels will be provided. Each room has two single beds, two mirrors, book shelves, and wall light. There

are no private bathrooms; instead, each floor has one central bathroom that has private toilets, shower stalls, and wash basins. Bathrooms will be designated single sex.

Meals included in the residence hall package are: breakfast and barbeque dinner on Friday, June 26; breakfast and banquet dinner on Saturday, June 27; and brunch on Sunday, June 28. Breakfast will be served cafeteria-style in the Unit I Dining Room between 7:15 and 8:30 am. Sunday brunch will be served from 11 am-1 pm.

The Unit I office telephone can be used for relaying emergency messages only. The number is (415) 642-3141. The office is open Monday through Friday, 8 am to 5 pm. Messages will be posted on the bulletin board in the lobby of Freeborn Hall.

EARLY ARRIVAL/EXTENDED STAY

If you plan to arrive early or want to extend your stay, you can make reservations at the University Guest Residence (Stern Hall), located at Hearst and Gayley Roads. The Guest Residence operates like a hotel during the summer. Room rates are $30 per night for two sharing a room, $25 per night for one. To make reservations, call the Conference Services Office at (415) 642-4444. After June 1, call the Guest Residence directly at (415) 642-5725.

PARKING

All meeting participants can park in the Residence Hall lot of Parking Structure D, across from the Unit I between Channing and Haste Streets. The cost is 75 cents/day. You must have quarters to purchase a permit/ticket from the dispensing machine at the lot. During the week, on-campus parking is restricted to faculty and senior staff; on weekends it is unrestricted.

CLIMATE

Summer weather in the Bay Area can be highly variable, although rain is extremely unlikely. Typical daytime temperatures in downtown San Francisco are a chilly, foggy 56 degrees F, while a daytime high is often about 95 degrees east of the Berkeley Hills. Berkeley is between these vastly different climates and may be warm but not hot. Bring sweaters or a lightweight jacket for early mornings and evenings.

THURSDAY MORNING & AFTERNOON, JUNE 25

9:00 - 5:00 OPEN HOUSE
Essig Museum of Entomology
109 Wellman Hall

11:00 - 5:00 REGISTRATION
Residence Halls Unit 1
2650 Durant Ave.
(1/2 block east of the Durant Hotel)

1:00 - 5:00 EXECUTIVE COUNCIL MEETING
133 Gianinni Hall

THURSDAY EVENING, JUNE 25

7:30 - 10:00 WELCOME OPEN HOUSE : WINE & CHEESE SOCIAL
Hosted by BioQuip Products
At the home of Liz Randal & Jerry Powell
1816 Yosemite Road, Berkeley
(ca. 2 mi. N. of campus)
Bus service from Residence Halls at 7:30

FRIDAY MORNING, JUNE 26

2503 Life Science Bldg

8:45 (1) WELCOME AND ANNOUNCEMENTS
J. A. Powell (Vice-chairman, Dept. Entomol. Sci., Univ. Calif., Berkeley, CA)

Throughout the program, papers marked * after the author are by students and eligible for the Comstock Award

Session 1
Symposium: Lepidopteran Behavior

A. M. Shapiro - organizer & presiding

9:00 (2) FLOWER PREFERENCE AND LEARNING IN *Pieris rapae*
A. Lewis (Dept. EPO Biol., Univ. Colo., Boulder, CO)

Little is known about the behavior of adult Lepidoptera when searching for nectar. Observations of the cabbage white butterfly, *Pieris rapae,* reveal bee-like consistency in visits to flowers of single species. Logit analysis suggests this consistency is not due solely to fixed preferences and requires learning. Greenhouse observations suggest this butterfly is capable of learning about its

hosts, including nectar extraction methods, absence of reward and color. Choice in the field correlates well with initial nectar location time in greenhouse tests, and its variance. Results reveal a significance in behavioral flexibility that may help explain the *P. rapae's* success as a colonizer.

9:25 **(3)** EFFECT OF PREDATORY WASPS ON AGGREGATED CATERPILLARS
N. E. Stamp (Dept. Biol. Sci., S.U.N.Y., Binghamton, NY)

Predatory wasps have both direct (killing) and indirect (harassing) effects on aggregated caterpillars. The indirect effect is that, in response to attack by wasps, larvae move to the interior of hostplants where wasps have difficulty locating them, but where only old, shaded leaves are available. A field experiment demonstrated that growth of such larvae is significantly less than that of protected larvae. Lab tests confirm that larvae grow better at high (30-35°C) than low (15-25°) temperatures. These results for the buck moth *(Hemileuca maia)* are intriguing because these larvae are usually very defensive, but react specifically to wasps by retreating to suboptimal microhabitats.

9:50 **(4)** A METHOD FOR MEASURING DISPERSAL AND GENE FLOW IN LEPIDOPTERA POPULATIONS
J. L. Hayes (U.S.D.A./A.R.S., Stoneville, MS)

A technique is discussed for marking phytophagous insects using trace elements, which has great potential for both basic and applied research. The non-disruptive method allows detection of maternal (and to a lessor degree paternal) labels in fertilized eggs.

10:15 COFFEE BREAK

10:35 **(5)** ECOLOGICAL ASPECTS OF ANT ASSOCIATION AND HOSTPLANT USE IN RIODINID BUTTERFLIES
P. DeVries* (Dept. Zool., Univ. Texas, Austin, TX)

Thisbe irenea at Barro Colorado Island, Panama, showed mutualistic ant association increases larval survival. Ants act as bodyguards. Predation by polistine wasps and parasitoids significantly effects larval mortality. Larvae have stereotyped behaviors for "calling," feeding and "binding" individual ants for long periods using three sets of organs. Larvae provide a liquid of sugars and amino acids which ants protect; they manipulate ant behavior maintaining ants in a semi-aggressive state. All myrmecophilous riodinid larvae studied spend substantial time with their heads over, and feeding on, extra-floral nectaries; data show they grow faster than without EFN. Nectar feeding may be widespread among myrmecophilous Riodinidae.

11:00 **(6)** RULES OF THUMB VS. COMPLEX BEHAVIOR IN FEMALE AND MALE BUTTERFLIES
S. P. Courtney (Dept. Biol., Univ. Oregon, Eugene, OR)

How do butterflies make complex "decisions?" Various possibilities are explored in light of optimization concepts.

11:25 DISCUSSION

GROUP PHOTOGRAPH
11:50

FRIDAY AFTERNOON, JUNE 26
145 Dwinelle Hall

Session 2: Systematics & Morphology
J. T. Sorensen - presiding

1:30 (7) GENETIC RELATIONSHIPS AMONG POPULATIONS OF THE *Coenonympha "tullia"* COMPLEX (NYMPHALIDAE: SATYRINAE) IN NORTHERN CALIFORNIA
A. H. Porter* (Dept. Zool., Univ. Calif., Davis, CA)

The current classification of the *Coenonympha "tullia"* complex in North America is a compromise: four parapatric species, each comprised of up to several subspecies. California claims two of these "species" *C. californica californica* and *C. californica eryngii* occur west of the Sierra-Cascade ranges, and *C. ampelos ampelos* and *C. ampelos mono* occur east of the Sierra. The first three entities appear to intergrade where their ranges contact, even across "species" boundaries. The results of a genetic analysis of these populations using enzyme electrophoresis are presented, and the associated biogeographic and taxonomic problems are discussed.

1:45 (8) ASYMMETRY IN MALE GENITALIA OF HESPERIIDAE: A MATHEMATICAL CONSIDERATION
H. Chiba (Dept. Entomol., Univ. Hawaii, Honolulu, HI)

Bilateral asymmetry in male genitalia is commonly found among Hesperiidae. Despite its significance, morphogenetic reasoning of this feature has not yet been discussed. A simple mathematical model is presented to explain different degrees of asymmetry in genitalia. Male genitalia of Lepidoptera is a terminal structure modified from abdominal segments 8, 9 and 10. The abdominal segment of an insect can be considered as the lateral surface of a cylinder. Geometric transformation of the cylinder can explain any degrees of asymmetry in genitalia found in Hesperiidae. This idea agrees with D'Arcy Thompson's rational morphology and modern prosperity of developmental biology.

2:00 (9) POSSIBLE ORIGIN AND AFFINITIES OF THE HESPERIID GENUS *Pyrrhocalles* (HESPERIIDAE: HESPERIINAE)
J. Y. Miller & L. D. Miller (Allyn Museum Entomol., Florida State Museum, Sarasota, FL)

The genus *Pyrrhocalles,* one of seven endemic hesperiid genera represented in the West Indies, is presently associated with Evans' Group I, an artificial construct of 15 perhaps unrelated neotropical genera. Based on current biogeographical evidence and the

morphological reexamination of representative genera within Evans' I and J groups, the possible origin and systematic affinities of the genus *Pyrrhocalles* are presented.

2:15 **(10) A DISTINCTIVE NEW SUBSPECIES OF *Ochlodes yuma* (HESPERIIDAE) FROM NEW MEXICO**
R. E. Stanford & S. J. Cary (Univ. Colorado Medical Center, Denver, CO; Santa Fe, NM)

A new subspecies of *O. yuma* is described from the Rio Grande gorge, Taos Co., NM. It differs from known populations in having an ochraceous ground color on the VHW, against which a narrow postmedian band of yellow stands out conspicuously. The fuscous border on the DW is also broader. The new ssp, as is true for the species generally, is associated with *Phragmites communis* in a seep association near a permanent water source. It will be named *anasazi* for the ancient Native American people who inhabited the region nearly two thousand years ago.

2:30 **(12) THE USE OF LARVAL CHAETOTAXY IN DISCRIMINATING SUBGENERA OF *Callophrys* (LYCAENIDAE)**
G. Ballmer (Dept. Entomol., Univ. Calif., Riverside, CA)

The hairstreak genus *Callophrys* is divided into several subgenera on the basis of differences in biology and adult alar and genitalic characters. In some subgenera there is uncertainly as to the specific relationships of populations best distinguished by locality and/or host plant association. An examination of the chaetotaxy, especially of the first instars, reveals new insights into taxonomic relationships among both the species and subgenera of this genus. This information suggests that some currently popular ideas about relationships may be in error.

2:45 **(13) EULIINI PHYLOGENINI: A TROUBLESOME TORTRICINE TRIBE**
J. W. Brown & J. A. Powell (Dept. Entomol. Sci., Univ. Calif., Berkeley, CA)

Until recently, the Cnephasiini represented a polyphyletic assemblage of symplesiomorphic tortricine genera. Except for studies on the musculature of the male genitalia, relationships within the tribe were problematic. Powell's recent elevation of the subtribe Euliae to tribal status provides an interim solution; 24 neotropical genera were transferred from the Cnephasiini to the Euliini. The genera remaining in Cnephasiini comprise a primarily Holarctic, monophyletic group defined by a floricomous ovipositor and minute spines on the uncus. Present definition of the Euliini, however, is based only on symplesiomorphies. Cladistic analyses were conducted to (1) identify relationships among euliine genera, and (2) find synapomorphies to support the monophyly of the group.

3:00 COFFEE BREAK

3:20 **(14) PROBABLE INTERBREEDING OF *Callophyrs (Mitoura) gryneus* (HÜBNER) AND *siva* (W. H. EDWARDS)**
S. J. Cary (Santa Fe, NM)

In southeast New Mexico and west Texas, *Callophrys (Mitoura) siva* and *C. (M.) gryneus* fly sympatrically, synchronously and share the larval hostplant *Juniperus*. A long series was taken in a single locality on a single day. This series consists primarily of typical *siva*, with a regular postmedian line and no postbasal spots on the ventral hindwing. A few are typical *gryneus castalis*, with an irregular postmedian line and two basal spots. Many are typically intermediate, having a variable postmedian line and postbasal spots variably expressed. A single breeding population is suggested.

3:35 **(15)** Is *Styx infernalis* A RIODINID?
R. K. Robbins (Smithsonian Instit., N.M.N H., Washington, DC)

Ehrlich isolated the Peruvian *Styx infernalis* in its own subfamily, primarily on the basis of its unusual male foreleg. However, Forbes countered that its male foreleg morphology is typically riodinid. I illustrate foreleg morphology for lycaenids, riodinids, nymphalids and *Styx*, and then assess these conflicting claims.

3:55 **(16) Panel Discussion: THE VALUE OF SUBSPECIES**

RATIONALS FOR INFRASPECIFIC NOMENCLATURAL USE
L. D. Miller (Allyn Museum Entomol., Florida State Mus., Sarasota, FL)

INFRASPECIFIC VARIATION AND EVOLUTION
J. Hafernik (Dept. Biol., San Francisco State Univ., S.F., CA)

"OBJECTIVE" ANALYSIS IN INFRASPECIFIC DIFFERENTIATION
R. A. Arnold (Entomol. Consult. Serv., Pleasant Hill, CA)

POLITICS OF INFRASPECIFIC DIFFERENTIATION
P. A. Opler (U.S. Dept. Interior, Ft. Collins, CO)

CONSERVATION AT THE INFRASPECIFIC LEVEL
D. Murphy (Ctr. Cons. Biol., Stanford Univ., Stanford, CA)

DISCUSSION

5:20 ORGANIZATIONAL MEETING FOR THE SIERRAN FIELD TRIP(S)
J. Mori & R. Wells, Co-leaders

FRIDAY EVENING, JUNE 26

Haas Clubhouse, Strawberry Canyon, U. C. Campus

7:00 BARBEQUE

8:30 SLIDE FEST (please bring 6-8 35mm slides of species or trips of interest)

SATURDAY MORNING, JUNE 27

145 Dwinelle Hall

Session 3: Behavior and Physiology

R. E. Stanford - presiding

8:45 **(17)** SPRUCE BUDWORM: ROLE OF ADULT IMBIBING IN REPRODUCTION (TORTRICIDAE: TORTRICINAE)

W. E. Miller (Dept. Entomol., Fisheries & Wildlife, Univ. Minn., St. Paul, MN)

Laboratory-caged budworm (*Choristoneura fumiferana* [Clemens]) adults readily imbibed water droplets adhering to balsam fir foliage, as well as honey-sweetened and nonsweetened water in foam-latex sponges. Performance in 6 aspects of reproduction improved 27% to 108% when adults imbibed water compared with nothing, and 15% to 72% when they imbibed sweetened water compared with nonsweetened water. Respective gains in total fecundity were 27% and 20%; in number of eggs laid, 56% and 64%. Imbibing enabled oocyte production to continue after eclosion, and oocyte maturation to proceed faster, phenomena previously undocumented for tortricines. Precipitation supplies water for natural imbibing, and a possible sweetener is honeydew of the balsam twig aphid (*Mindarus abietinus* Koch).

9:00 **(18)** PLANT CHEMISTRY AND OVIPOSTION BEHAVIOR IN THE BUCKEYE BUTTERFLY, *Junonia coenia*

P. Pereyra & M. D. Bowers (Museum Comp. Zool., Harvard Univ., Cambridge, MA)

Females of *Junonia coenia,* a specialist on plants that contain iridoid glycosides, were found to use iridoid glucosides typical of a hostplant, *Plantago lanceolata* (Plantaginaceae), as oviposition cues. In both no-choice and choice tests, females laid more eggs on agar discs with *P. lanceolata* leaf material or pure iridoid glycosides, compared to agar controls. Individual females differed in their preference for discs with P. l*anceolata* leaf material versus discs with pure iridoid glycosides. Females given a choice of three different concentrations of iridoid glycosides in the agar discs and a control, preferred those with the highest concentration of iridoid glycosides.

9:20 **(19)** BUTTERFLY HILLTOPPING IN A POPULATION CONTEXT

J. F. Baughman* (Dept. Biol. Sci., Stanford Univ., Stanford, CA)

Hilltopping by individuals in a closed population of *Euphydryas editha* was investigated. The occurrence of the behavior by males is strongly determined by the age structure and density of the population; that of females is not. Some males, however, do not hilltop but patrol the slopes below. Comparing the relative selective advantages of these strategies depends on understanding all aspects of the population's structure, not just individual behavior.

9:40 **(20)** SEX AND COMFORT: THE ULTIMATE GOAL OF BEHAVIORAL EVOLUTION IN PAPILIONOIDS?
J. T. Sorensen & K. H. Sorensen (Insect Taxon. Lab., C.D.F.A., Sacramento, CA; El Dorado Hills, CA)

Evidence for the use of thermic exploitive behavior is reviewed for papilionoids with reference to mating strategies where males employ perching versus patrolling tactics. A thermic exploitive model is proposed under which papilionoid mating systems evolve if thermic exploitive behavior is correlated with incidental reproductive fitness benefits, expressed as an increased rate of intersexual encounters over non-thermic exploitive behaviors. Male competitive interactions and lek evolution are considered derived from selection for energy efficient behavioral mechanisms. The model considers Game Theory, the multivariate evolution model of polygenically linked behaviors, and the interaction of sexually dimorphic behaviors in view of developing evolutionary stable strategies.

10:00 COFFEE BREAK

10:20 **(21)** LARVAL MOBILITY IN CHECKERSPOT BUTTERFLIES
R. R. White (Dept. Biol., City College San Francisco, S.F., CA)

Larvae were marked with individual codes in paint, weighed and released into the field. Recovery of marked larvae, followed by reweighing, provided data on: (1) growth for known periods of time, (2) dispersal distances, and (3) dispersion directions. Growth is related to estimated insolation for particular slope exposures. Dispersal is almost nonexistent under some conditions, but may exceed 6 m/day under other circumstances. Individuals were found as far as 56 m from their release points. Some directionality in movement was found, but most movement could be characterized as random.

10:40 **(22)** WHY AND HOW *Nymphalis californica* MIGRATES
O. A. Shields (Mariposa, CA)

The migrations of *Nymphalis californica* in various directions result primarily from down-canyon flushings during warming trends. Exodus flights issue from population sites during years of subpar precipitation. The "urge" for adults to migrate stems from migrations of their nervous, gregarious larvae in search of food following *Ceanothus* defoliation. Migration orientation to a particular direction is maintained by some sort of sun-compass reckoning; masking experiments indicate the ocelli see the sun while the compound eyes see the plane of polarized light. Fluctuations in flight directions are increased by cross-barriers.

11:00 **(23)** A LITTLE MUSTARD IS NOT TOO SPICY FOR TOBACCO HORNWORM CATERPILLARS (MANDUCA SEXTA L.)
F. S. Chew & W. L. Mechaber (Dept. Biol., Tufts Univ., Medford, MA)

Glucosinolates (mustard oil glucosides) are thought to deter or poison non-adapted insects that attempt to eat mustard plants. Unlike black swallowtail butterfly larvae, a non-adapted species that

does not successfully develop on food containing sinigrin (a glucosinolate), tobacco hornworm larvae grow surprisingly well on food containing this compound. They excrete the compound unchanged. These results suggest that tobacco hornworm larvae do not eat mustard plants in nature for reasons other than their ability to handle this major component of the plant compounds found in mustards.

11:15 **(24)** EYE SPOTS OF SATYRIDS, MORPHIDS, BRASSOLIDS AND AMATHUSIDS: SATYRIDS DO NOT EXPLOIT THE FALSE HEAD PATTERN
B. H. Landing (Woodland Hills, CA)

Among lycaenids and riodinids, tail(s) on the hindwing with an eye spot(s), near the anal angle verso, form a protective "false head" pattern. Tailed papilionids and nymphalids show significant incidence of this pattern. 532 satyrids of afrotropical, oriental and australian regions (146 tailed; 386 not; 170 with anal angle spot; 241 not) show a negative association of tails with anal angle region eye spots), as does genus *Lethe* (29/48 tailed). Morphids (14 tailed *Antirrheae* and *Caerois*) and amathusids (tailed *Amathusia, Amathuxidia* and *Zeuxidia*) show positive association. Tailed brassolids are too few for analysis. Satyrids differ from allies and nymphalids in non-exploitation of falsehead pattern. Possible phylogenetic and other implications are discussed.

SATURDAY AFTERNOON, JUNE 27

Concurrent Sessions: 4 & 5
145 & 155 Dwinelle Hall

Session 4: Systematics and Morphology

145 Dwinelle Hall
C. V. Covell, Jr. - presiding

1:00 **(25)** RELATIONSHIPS WITHIN THE *Agylla/Eilema* LINEAGE OF THE LITHOSIINAE (ARCTIIDAE)
N. L. Jacobson* (Dept. Zool., Univ. Texas, Austin, TX)

A "phylogeny" of the Lithosiinae was produced by Hampson at the turn of the century which was based primarily on wing venation. The *Agylla/Eilema* portion of Hampson's tree is discussed here within the context of his interpretation of the wing venation and some larval and adult characters that I have found within this group.

1:20 **(26)** A RETHINKING OF THE HIGHER CLASSIFICATION OF THE NOTODONTINAE (NOCTUIODEA: NOTODONTIDAE)
S. J. Weller* (Smithsonian Instit., N.M.N H., Washington, DC)

According to recent analysis, three tribes of the subfamily Notodontinae - Nystaleini, Hemiceratini, and Dioptini - are paraphyletic with respect to one another. The Dioptini and Hemiceratini form a monophyletic clade within the Nystaleini. I will discuss the stability of these results and propose a phylogeny for a these taxa.

1:40 **(27)** THE GEOGRAPHIC PATTERNS OF ENZYME POLYMORPHISMS IN *Euphilotes battoides* (BARNES & MCDUNNOUGH) (LYCAENIDAE)
G. Pratt* (Dept. Entomol., Univ. Calif., Riverside, CA)

Euphilotes battoides, a small blue butterfly, can be separated from other *Euphilotes* by differences in genitalia. It is systematically complex with a number of hostplant specific subspecies. All *Euphilotes battoides* larvae feed on flowers and seeds of perennial *Eriogonum,* wild buckwheats. These wild buckwheats not only overlap in distribution, but show differences in bloom times, so that some *E. battoides* populations can occur with earlier and/or later flying populations. Most *Euphilotes battoides* subspecies have been examined for differences in enzyme polymorphisms and some plant specific populations such as those on *E. fasciculatum* have been examined over a wide geographic range.

2:00 **(28)** DIFFERENTIATION OF BRACHYPTEROUS SYNDROMES IN SCYTHRID MOTHS (GELECHIOIDEA): QUANTITATIVE GENETIC ASPECTS OF WING DIMENSIONS
J. T. Sorensen & J. A. Powell (Insect Taxon. Lab., C.D.F.A., Sacramento, CA; Dept. Entomol. Sci., Univ. Calif., Berkeley, CA)

Wing dimensions were compared among 3 species of scythrid moths, one with normal wings and 2 that exhibit brachyptery (reduced wings) in both sexes. Quantitative genetic relationships among the wing dimensions were analyzed using principal component analysis and clustering of the eigenvector loading coefficients for the traits. With reference to the evolution of these morphological adaptations, we discuss (1) past selective pressures on, and (2) genetic linkages (i.e. pleiotropy) among the traits in relation to a multivariate evolution model. The wings show protagonistic and antagonistic covariant evolutionary suites of traits. Allometric and shape differentiation act independently for the brachypterous syndromes examined within the Scythrididae.

2:20 **(29)** TRANSFORMATION SERIES ANALYSES AND BIOGEOGRAPHY OF *Hamadryas*
D. W. Jenkins (Allyn Museum Entomol., Florida State Museum, Sarasota, FL)

Character analysis of the neotropical genus *Hamadryas* is presented, including outgroup comparison with other genera of the tribe Epicalini within the subfamily Eurytelinae. Cladistic and Tranformation Series Analysis using a PAUP II computer package indicate a phylogeny with *H. chloe* most primitive and *H. velutina* most advanced. Biogeographical study of *Hamadryas* and its Euphorbiaceae host plants results in postulation of four significant vicariance and three dispersal events. The "refugium theory" during the Pleistocene is not supported by *Hamadryas.*

2:40 **(30)** BIOSYSTEMATICS OF THE OPOSTEGIDAE
D. R. Davis (Smithsonian Instit., N.M.N H., Washington, DC)

Few families of Lepidoptera have been as little studied as the monotrysian family Opostegidae. Although worldwide in distribution, only 104 species have been described. Until 1985 only one generic

name was recognized. A review of the biology, generic classification, and phylogeny is presented as part of a long term study of the monotrysia.

3:00 COFFEE BREAK

3:20 **(31)** A PROPOSED VICARIANCE MODEL FOR THE BIOGEOGRAPHY OF THE WEST INDIAN BUTTERFLIES
L. D. Miller & J. Y. Miller (Allyn Museum Entomol., Florida State Museum, Sarasota, FL)

Examination of the age of butterflies, the endemism of the West Indian species, and their propensities toward dispersal when considered along with current geological data, suggest that a classical dispersalist model for their biogeography is untenable. A combination vicariance/dispersalist model for the evolution of the Antillean butterfly fauna is proposed within the general constraints of current plate tectonic theory. Jamaica is postulated to have occupied a more westerly position during the early Tertiary than is now documented, and the southern Hispaniolan block similarly is thought to have been closer to Yucatan during the Eocene than previously believed.

3:40 **(32)** *Hesperia/Atalopedes:* DRAWING THE LINE AND INFERRING PHYLOGENY (HESPERIIDAE)
J. M. Burns (Smithsonian Instit., N.M.N H., Washington, DC)

The large genus *Hesperia* and the small genus *Atalopedes* are probably sister-groups. Though *Hesperia* has been well studied, *Atalopedes* has not. Emphasizing male and female genitalia, adequate samples, and a comparative approach, I define generic limits, remove one species from *Atalopedes,* add a new species to it, and work out the phylogeny of *Atalopedes.* Along the way, there are some surprises.

4:00 **(33)** SYSTEMATICS OF THE NEOTROPICAL MOTH FAMILY DALCERIDAE
S. E. Miller (Bishop Museum, Hololulu, HI)

The family Dalceridae includes 85 species in 11 genera. Cladistic relationships among the genera are discussed. Dalceridae are tentatively placed in a monophyletic group including Epipyropidae, Limacodidae, and Megalopygidae, but many problems exist in the higher classification of the families associated with Zygaenoidea and Cossoidea. Dalceridae are restricted to the Neotropical region, with one species, *Dalcerides ingenita* (Hy. Edw.), occurring as far north as Arizona. The slug-shaped larvae, distinctive in their dorsal covering of gelatinous conical tubercules, appear to be general feeders on smooth leaved trees and shrubs.

4:20 **(34)** CLASSIFICATION OF NORTH AMERICAN SEMIOTHISINI (GEOMETRIDAE) BY HOST PLANTS
D. C. Ferguson (U.S.D.A./S.E.L., N.M.N.H., Washington, DC)

Moths of the tribe Semiothisini in America north of Mexico number more than 150 species, of which 90% are in the genera *Semiothisa* Hbn. and *Itame* Hbn.. Food plants are now known or can be

anticipated for about 75% of the tribe. They utilize plants of surprisingly few families and tend to be host specific in a way that correlates closely with species classifications in *Semiothisa* , although less predictably so among other members of the tribe. Most of the *Semiothisa* species are distributed among only three plant groups: conifers, legumes or willows.

4:40 **(35)** REVISION AND PHYLOGENY OF *Asterope (=Callithea):* (NYMPHALIDAE)
D. W. Jenkins (Allyn Museum Entomol., Florida State Museum, Sarasota, FL)

Asterope (formerly *Callithea*) includes some of the most beautiful butterflies in South America. A completed revision recognizes eight species and ten subspecies, two of which are new. Of 38 taxa previously described, 16 are newly synonymized and the status of 12 is revised. The biology, mimicry, and collecting methods are discussed. *Asterope* is assigned to the subfamily Eurytelinae, tribe Epiphilini. The closest related genus is the sister group *Pyrrhogyra.* Cladistic and Transformation Series Analyses using a PAUP II computer package are presented. The resulting phylogeny indicates *A. batesii* to be the most primitive and *A. optima* the most derived. Two subgenera, *Asterope* and *Callithea* are recognized.

5:00 **(36)** A CLARIFICATION OF THE TYPE LOCALITY OF *Catocala whitneyi* DODGE (NOCTUIDAE)
E. H. Metzler (Columbus, OH)

Catocala whitneyi Dodge has been reported from Ohio several times, but no valid Ohio specimens have been found. There is no evidence early Ohio lepidopterists collected this species. In 1913 Hampson cited a Type specimen from Ohio in the British Museum (Natural History), but in 1907, Beutenmuller claimed all the types were destroyed by fire. The specimen labeled Type is not from Ohio. The type locality, "Ohio, Ill." is really the town of Ohio in the State of Illinois. Previous reports of this species from Ohio probably result from understandable confusion over the type locality.

Session 5: Ecology and Conservation

155 Dwinelle Hall
M. D. Bowers - presiding

1:00 **(37)** LARVAL VIABILITY OF HAND-PAIRED SUBSPECIFIC AND INTERSPECIFIC CROSSES OF *Papilio glaucus* AND RELATED SPECIES
R. C. Lederhouse & J. M. Scriber (Dept. Entomol., Mich. State Univ., East Lansing, MI)

Various combinations of subspecies and species were hand-paired in our laboratory. Fertility and viability of eggs were determined for females pairing for 30 minutes or longer. After death, these were dissected to determine the presence and size of the spermatophore. Average viability for interspecific crosses of *P. glaucus* females was 43.9% with *P. multicaudatus* males, 42.3% with *P. eurymedon* males, 41.4% with *P. rutulus* males and 39.3%

with *P. alexiares* males. Viability of eggs from subspecific crosses were generally higher. Results were quite variable with 0 to 90% viability observed for several of the pairing types. We are continuing these pairings and adding to our data base.

1:20 **(38)** THE RECOVERY OF THE ENDANGERED SCHAUS SWALLOWTAIL IN THE FLORIDA KEYS

T. C. Emmel, M. C. Minno & J. L. Nation Jr. (Dept. Zool., Univ. Florida, Gainesville, FL)

The Schaus Swallowtail, *Papilio (Heraclides) aristodemus ponceanus* Schaus (family Papilionidae) is a large and colorful butterfly endemic to southern Florida. At the beginning of this century, it occurred from the hammocks of the Miami area south to at least Lower Matecumbe Key. It became extinct on the mainland of Florida after 1924 and by 1984, its range was extremely reduced, and the total population numbered fewer than 70 adults. We report the recovery of this species from near-extinction during the 1984-87 period and assess factors involved in its population ecology that may have caused the historic decline and now recovery.

1:40 **(39)** HABITAT ENHANCEMENT TECHNIQUES FOR THE EL SEGUNDO BLUE BUTTERFLY (LYCAENIDAE)

R. A. Arnold & A. E. Goins (Entomol. Consult. Serv., Pleasant Hill, CA; Cheveron Corp., S. F., CA)

In 1975, Chevron fenced a small coastal sand dune remnant at its El Segundo refinery to protect habitat of the endangered El Segundo Blue butterfly. Encroachment by weeds and annual grasses rapidly stabilized the dune, limiting seedling establishment by the butterfly's foodplant, Seacliff buckwheat. As surviving buckwheats aged, they produced fewer essential flowers for adults, causing a decline in butterfly numbers. In 1983, longterm management to improve habitat quality at the refinery's sanctuary effected: (1) supplemental outplantings of local buckwheat seedlings, (2) selective weeding, (3) annual population monitoring, and (4) site security. Since 1983, flower production has increased annually and the butterfly has begun to forage on outplants.

2:00 **(40)** THE DAY BUTTERFLY CENTER: IT'S GOALS AND ASPIRATIONS

F. C. Ella (Day Butterfly Center, Callaway Gardens, Pine Mountain, GA)

Callaway Garden's Day Butterfly Center will open to the public in late spring 1988. The first butterfly display of its kind, the center will feature an outdoor native butterfly and an indoor tropical butterfly display. The Day Butterfly Center's potential as a research tool as well as the difficulties in designing and operating the facility are discussed.

2:20 **(41)** THE VICEROY BUTTERFLY IN FLORIDA: MODEL OR MIMIC ?

D. Ritland* (Dept. Zool., Univ. Florida, Gainesville, FL)

Light and dark geographic races of eastern viceroy butterflies (*Limenitis a. archippus* and *L. a. floridensis*, respectively) are considered palatable Batesian mimics of the monarch *(Danaus*

plexippus) and the Florida queen *(D. gilippus berenice).* I propose that the viceroy is itself unpalatable to birds and that Florida queens may be either Müllerian or Batesian mimics of dark viceroys. Studies are underway assessing palability and fluctuation in the relative spatiotemporal frequency of this mimic group in Florida and Georgia. Seasonal and geographic variation in abundance and palatability causes a dynamic mimicry relationship between these butterflies.

2:40 **(42)** LOCAL EXTINCTION AND RECOLONIZATION IN THE DYNAMICS OF A *Euphydryas editha bayensis* METAPOPULATION
S. Harrison* (Dept. Biol. Sci., Stanford Univ., Stanford, CA)

A model of metapopulation of the Bay Checkerspot butterfly, *Euphydryas editha bayensis* is developed to answer questions of ecological and conservation interest. The concept of the metapopulation, or "population of populations" is reviewed, and its status in the evolutionary and ecological literature is discussed. Field work begun to test the model is presented.

3:00 COFFEE BREAK

3:20 **(43)** COLOR MORPH DETERMINATION IN SPHINGID CATERPILLARS
L. S. Fink* (Dept. Zool., Univ. Florida, Gainesville, FL)

Color and pattern polymorphisms are widespread in larval Sphingidae. A green/brown color dimorphism arising in the fifth instar is commonest, but great variation occurs in the extent and timing of the polymorphisms. For example, *Amphion nessus* reverts from color dimorphism in intermediate instars to monomorphism in the last. *Eumorpha fasciata* also shows greatest phenotypic variation in the fourth instar, but its polymorphism involves pattern as well as ground color. I will discuss genetic, environmental, and hormonal influences on morph determination in the Sphingidae and speculate on the causes of these interspecific differences.

3:40 **(44)** THE ROLE OF MYRMECOPHILY IN THE DISTRIBUTION OF FOUR SOUTHERN CALIFORNIA POPULATIONS OF *Brephidium exilis* (LYCAENIDAE)
K. M. Calloway* (Dept. Ecol. & Evol. Biol., Univ. Calif., Irvine, CA)

Ant associates, parasitoids and hostplants are presented for populations of *B. exilis* in Bishop, Big Pine, Irvine and Seal Beach. Distribution of *B. exilis* (larvae and adults) is correlated with tending ant presence at each locality. Evidence is presented to suggest that females use ants as ovipositional cues. Results from experiments determine whether: (1) females display ovipositional preference for plants infested with a particular ant species when presented with plants infested with ant species of varying protective abilities (i.e. differing potentials for increasing larval survivorship), and (2) this preference results from selection or an innate ability to perceive relative protective abilities among ants.

4:00 **(45)** THE COMMUNITY ECOLOGY OF BUTTERFLIES IN THE UPPER FLORIDA KEYS

M. C. Minno* & T. C. Emmel (Dept. Zool., Univ. Florida, Gainesville, FL)

The butterfly fauna of Elliott Key in Biscayne National Park is compared to that of Key Largo, a nearby island where habitat degradation has increased greatly in recent times. Species composition and relative abundance differences occur between the two islands due to variation in host plant distribution and habitat disturbance. About half of the butterflies recorded from the islands consist of transient species. Species richness and relative abundance of adult butterflies follow seasonal trends and are greatest late in the wet season during August and September.

4:20 **(46)** BUTTERFLY ECOLOGY IN THE HIGH ANDES OF NORTHWESTERN AGRENTINA - CURIOUSER AND CURIOUSER

A. Shapiro (Dept. Zool., Univ. Calif., Davis, CA)

The little known, little collected Andean region of northwestern Argentina is the home of some of the rarest butterflies on the continent, including *Tatochila distincta distincta, T. inversa,* and an as yet undescribed species of sexually dimorphic *Yramea,* near *inca,* which is remarkably convergent in phenotype to *Boloria improba.* A general faunistic overview is presented, with slides illustrating butterfly habitats and biogeographic relations on a transect from San Miguel de Tucuman through the Cumbres Calchaquies to the Valles Calchaquies and east to Salta via the Cuesta del Obispo.

4:40 **(47)** BIOLOGY OF TWO UNUSUAL GRACILLARIIDAE

D. R. Davis (Smithsonian Instit., N.M.N H., Washington, DC)

Neurostrota gunniella (Bsk.) and *Phyllonorycter emberizaepenella* (Bouche) demonstrate very different, major biological divergences from that considered typical for the Gracillariidae. Within a family whose larvae almost exclusively are leaf or stem miners, the later instars of *N. gunniella* are pith borers. *Phyllonorycter emberizaepenella* is even more aberrant in being parthenogenetic, the first reported case for this family.

5:00 **(48)** RECOLONIZATION OF BUTTERFLIES IN A CHAPARRAL BURN

R. Kelson (Clayton, CA)

Recolonization of butterflies in a chaparral community was observed for two years subsequent to a wildfire in Napa Co., California. Comparison was made with the butterfly fauna of adjacent unburned chaparral. Within one year, adults of nearly all species occurring in the unburned area were found on the burn. Factors attracting adults to the burn may have been abundance of nectar sources, larval hosts and open spaces. Larvae of 8 species were found on the burn. *Euphydryas chalcedona* recolonized the burn, in part, by movement of post-diapause larvae. These results may not apply to larger, more uniform, or more intense fires.

5:20 ORGANIZATIONAL MEETING FOR THE MT. DIABLO BUTTERFLY COUNT, JUNE 29
R. Kelson, coordinator

SATURDAY EVENING, JUNE 27

University Dining Commons
Lower Level Sproul Plaza

6:30 ATTITUDE ADJUSTMENT HOUR
Hosted by Dept. of Entomol. Sci., UC Berkeley

7:30 BANQUET

8:30 PRESENTATION OF AWARDS
Karl Jordan Medal
John A. Comstock Award

9:00 **(49)** PRESIDENTIAL ADDRESS: MAN VS. MOTH - INDICATIONS OF A CHANGING NORTH AMERICAN FAUNA
D. C. Ferguson

9:45 DOOR PRIZES
C. V. Covell, Jr.

SUNDAY MORNING, JUNE 28

145 Dwinelle Hall

8:45 **(50) Panel:** SOCIETY PUBLICATIONS: PLANS & POLICIES
C. V. Covell Jr. - Managing editor: Memoirs of the Lepid. Soc.
W. E. Miller - Editor: J. of the Lepid. Soc.
J. Preston - Editor: News of the Lepid. Soc.

Session 6: Fauna & Distribution

J. Y. Miller - presiding

9:15 **(51)** MARINA DUNES, MONTEREY COUNTY, CA: AN UNUSUAL BUTTERFLY HABITAT
R. L. Langston (Kensington, CA)

Lepidopterists generally visit the Marina Dunes to seek out the well-publicized *Callophrys, Euphilotes* and *Apodemia.* During 30 visits from 1962 to 1987 (Feb. to Nov.) I recorded 30 butterfly species. Although most species can be common elsewhere, some are unusual in these coastal dunes: *Pieris protodice* and *Speyeria coronis* (unusual along beaches in central CA); *Callophrys dumetorum* and *C. viridis* (synchronous); *Leptotes marina* (northern record for immediate coast); *Lycaena helloides* (usually inland in Valley, Delta or agricultural fields); and *Charidryas gabbi* (near northern range limits).

9:30 **(52) INTERESTING RECORDS OF LEPIDOPTERA OVER THE 23-YEAR HISTORY OF THE KENTUCKY LEPIDOPTERA SURVEY**
C. V. Covell Jr. (Dept. Biol., Univ. Louisville, Louisville, KY)

Since the beginning of the Kentucky Lepidoptera Survey in 1964, 2,185 Lepidoptera species have been recorded in 63 families. Numerous range extensions have resulted from identifications, and undescribed species have been discovered. Notes on these and other interesting records are presented along with historical comments on the survey.

9:45 **(53) THE OECOPHORIDAE *(sens. lat.)* OF SAN BRUNO MOUNTAIN, SAN MATEO COUNTY, CALIFORNIA**
J. A. DeBenedictis (Dept. Entomol. Sci., Univ. Calif., Berkeley, CA)

The adults, larval hosts and habitats of the ten species of Oecophoridae known from San Bruno Mountain are discussed. Two of these are introduced insects. A third is likely introduced. There are no known undescribed or endemic species. Recent housing development has destroyed the collection site of *Ethmia albitogata* Wlsm., whose larval host is uncommon elsewhere on the mountain. No other oecophorid is threatened by impending development. The larval hosts of 12 other oecophorids of the San Francisco area occur on the mountain, but neither larvae nor adults have been collected.

10:00 **(54) BUTTERFLIES OF THE GUADALUPE MOUNTAINS, SOUTHEAST NEW MEXICO AND WEST TEXAS**
R. W. Holland & S. J. Cary (Albuquerque, NM; Santa Fe, NM)

More than 120 species of butterflies and skippers are known from the study area, which includes Carlsbad Caverns and Guadalupe Mountains National Parks. The semi-arid Guadalupe Mountains range from 3500 to 8500 feet above sea level, separating the Chihuahuan desert from the high plains to the east. Because perennial water is scarce in this deeply dissected range, springs constitute critical butterfly habitat. The Lower and Upper Sonoran Zone butterfly fauna is diverse and includes several local riparian species. Many subtropical transients are found in summer months. Some Ice Age relict species persist in the forested high country.

10:20 **(55) LAKE COUNTY, CALIFORNIA: BUTTERFLY BIOGEOGRAPHY**
R. Kelson (Clayton, CA)

Data on Lake Co. butterflies were obtained by examination of museum specimens, taking records from the literature, correspondence with lepidopterists, and my collecting. At least 98 species occur in the county. Eleven species are polytypic within the county and another 18 are at or near distributional limits. Unusual sympatries and synchronies exist. Butterfly distribution in the county reflects increasing gradients S to N of elevation and E to W of moisture, causing chaparral of the Californian biotic province in the SE to give way to yellow pine and ultimately red fir forest of the Sierran biotic province in the NW.

10:40 **(56)** SURVEY OF THE LEPIDOPTERA OF TAIWAN
J. B. Heppner (Florida State Coll Arthrop., Florida Dept. Agric & Consum. Serv., Gainesville, FL)

Since 1982, NSF sponsored (in part) surveys of the Taiwan Lepidoptera have resulted in ca. 4,210 species recorded from the island. Many plant and animal habitats are provided by the diverse topography, which ranges from the near sea level western plains to nearly 4000 m elevations with several peaks above 3500 m. The high elevations (down to 1000 m) provide an apparent refugium for Tertiary flora. Many species found there are also found only in the Himalaya mountains; thus a partially Himalayan Lepidoptera fauna is isolated on Taiwan. A series of books on the Lepidoptera of Taiwan will be published and authored by ca. 35 workers.

Business Meeting
D. C. Ferguson, presiding
11:00 - 12:00

SUNDAY AFTERNOON, JUNE 28

Field Trip
Marin County
1:30
Meet at residence hall
to coordinate rides

MONDAY, JUNE 29

8th Annual Mt. Diablo Butterfly Count
R. Kelson - coordinator

INDEX

STEERING COMMITTEE

Coordinator: J. A. Powell, University of California, Berkeley

Program: J. T. Sorensen, Calif. Dept. Food & Agric., Sacramento
J. E. Hafernik, San Francisco State University
A. S. Shapiro, University of California, Davis

Local Arrangements: J. A. Powell and Liz Randal
Mary Saito, U.C. Conference Services
Mark Garner, Cal Catering Service

Registration & Financial: John and Poody Brown

Artwork: Joe Fox

Collector's Guide: R. L. Langston

Field Trips: John DeBenedictis, John Brown, Rich Kelson, Tom Koerber, Jim Mori, Dave Robinson, Ralph Wells

SPONSORS

BioQuip Products, Santa Monica, CA
Department of Entomological Sciences, Univ. of Calif., Berkeley