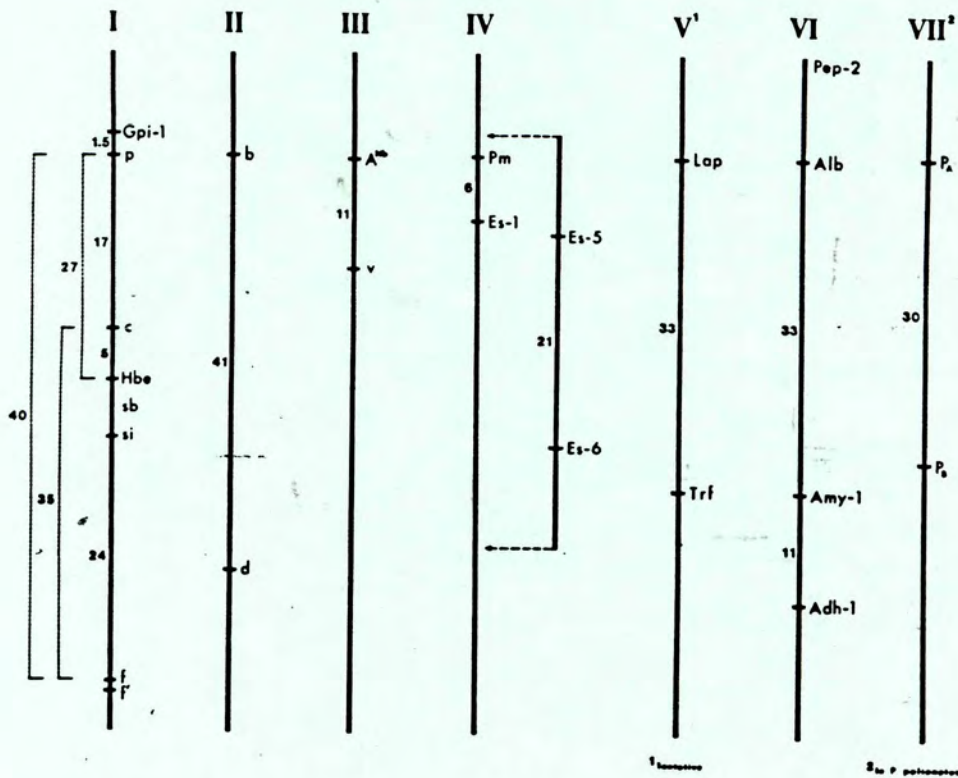


PEROMYSCUS NEWSLETTER

NUMBER THREE

LINKAGE MAP OF THE DEERMOUSE



MARCH 1987

Cover: The genetic linkage map
for Peromyscus maniculatus.
(See p. 18)

Third Issue.....

Here we go with **PEROMYSCUS NEWSLETTER** Number Three. Response to the first two issues has been enthusiastic. The number of contributed entries for this issue is the largest yet and our mailing list continues to grow. Thank you for your support and encouragement!

In this issue we are updating and correcting the gene lists for *P. maniculatus* and other members of this species group. These lists, organized into tables, are given on pages 14 through 17. Lists of known loci in *P. boylii*, *P. truei* and *P. leucopus* were given in PN #2. Gene listings for other species will appear in future issues.

The late Dr. **Ralph R. Huestis** of the University of Oregon is featured in our "Peromyscus Pioneer" sketch. For this section we relied heavily upon Robert D. Clark's **Ralph Huestis: Teacher, Naturalist, Scholar, Administrator** (1982. University of Oregon Foundation. 36 pages). Sue O. VanOoteghem graciously provided us with a copy of this biography. Information was also extracted from "**Francis B. Sumner and the Evolutionary Synthesis**" by William B. Provine (1979. In **Studies in the History of Biology** 3:211-240). Mr. Keith Richard of the University of Oregon Archives and Dr. Ruth W. Anderson of the Dental Biochemistry Department of the Oregon Health Science University at Portland also generously provided details. Our personal correspondence with Dr. Huestis during the 1960's was helpful as well.

!!!A provisional scheme of symbolic nomenclature to indicate karyotypes known in *Peromyscus* is included for the first time in this issue (See p. 20). Dr. C. William Kilpatrick and his associates kindly contributed their tables and references to this effort. Modification and refinements of this system, undoubtedly, will be adopted to include chromosomal variants (pericentric inversions, etc.) within species. Oscar Ward is coordinating this project!!!

PEROMYSCUS NEWSLETTER is not a formal journal and information in it should not be cited without permission of the individual contributor. Reports in **PEROMYSCUS NEWSLETTER** do not constitute "publication" in the usual academic or scientific sense. For this reason we encourage informal entries reporting work-in-progress, tentative results, stocks of *Peromyscus* on hand and other information which may not be appropriate in a formal journal. Entries in the newsletter are given verbatim and edited only for length and consistent format.

We hope you enjoy and benefit from PN #3 and we look forward to your contributions, comments and suggestions.

W. D. D.

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* * *

NEWS AND COMMENT

Dugway Colony Records: Dr. Harold Egoscue has generously provided us with color slides of some of the *Peromyscus* coat color mutations he identified when he was located at the Dugway Ecology Laboratory. These slides will be available in our resource file at the South Carolina *Peromyscus* Stock Center. During the twenty or more years his extensive deermouse colony was in existence he accumulated considerable data on reproductive performance which he retained. This data set may be of interest to some of our readers. Anyone who has an interest in this information should contact Dr. Egoscue at PO Box 787, Grantsville UT 84029.

W. E. CASTLE'S PEROMYSCUS SPECIMENS. For a brief period between 1907 and 1912 the famed mammalian geneticist W. E. Castle collected *P. leucopus* from sites in New England with the intention of analyzing the "ammodytes" and other color variants. These studies were largely unproductive and were abandoned. However, he made a number of study specimens of the animals. About 1969 we obtained some of these specimens from one of his former students, Dr. Clyde Keeler. Although they are not particularly well preserved, they may be obtained from the South Carolina *Peromyscus* Stock Center on loan for biological or historical research purposes.

FRESH OR FROZEN TISSUES NEEDED.....Bill Kilpatrick needs live specimens or frozen tissues of animals representative of the following taxa: *Podomys*, *Isthmomy*s, *Habromys* (except *H. lepturus*), *Neotomodon* and *Haplomyiomys* (except *P. eremicus* and *P. californicus*). These are needed for electrophoretic studies. In addition, he is in the process of building a DNA collection for DNA hybridization studies and is in need of live specimens of peromyscine-neotomine rodents. If you are able to assist Dr. Kilpatrick, he may be contacted at the Department of Zoology, University of Vermont, Burlington VT 05405. (See his entry in this newsletter)

Collection Data Sheet. We are again enclosing an updated version of the data sheet for Ann Baker. She will greatly appreciate any data you can obtain for her.

DO WE NEED A FORUM SECTION IN THE NEWSLETTER?

Several readers suggested that the newsletter should contain an open letter forum where issues of interest to peromyscologists could be discussed. The opportunity to engage in written dialogue would be provided. Some topics, e.g. Mike Carleton's systematics of peromyscine rodents, could be explored; or useful hints or suggestions about methodology, techniques, terminology, etc. could be exchanged. Should it be "deermouse" or "deer mouse"?

 *
 * **PAUL A. MOODY** *
 *
 * We have have been informed by his daughter, Marilyn *
 * Hurlbut, that Dr. Paul A. Moody died this past August *
 * at age 83 after a brief illness. Dr. Moody served for *
 * many years on the faculty at the University of Vermont.
 * As he mentioned in his letter quoted in PN #2, Paul *
 * Moody was one of Lee Dice's first graduate students. *
 * He was also among the very first to apply immunology *
 * to problems of systematics and evolution. Dr. William *
 * Kilpatrick has graciously offered to assist with a *
 * biographical sketch of Dr. Moody in a future issue of *
 * our newsletter. *
 *

Inbred line development. Progress continues in the development of inbred *Peromyscus*. George Smith of the Department of Pathology, UCLA Medical School, now has a line of sib-mated *P. leucopus* to the eighth generation, which he reports is more fertile than at generation five and six. He has another *P. leucopus* line to the seventh generation of sib-mating. He is maintaining other lines with limited crossing between lines.

At last report (Sept. 86) several lines of *P. maniculatus* at Jackson Laboratory at Bar Harbor were breeding at the 14th generation of sib mating or better. According to Muriel Davission no decision has been made as to whether Bar Harbor will continue to maintain *Peromyscus* or make their limited stocks generally available.

* * * *

Scott Wright who was formerly at the University of Connecticut working with Lyme disease in *P. leucopus* has moved to the Department of Infectious Diseases, University of Florida at Gainesville.

Jack Hayes has undertaken graduate work with Mark Chappell at U.C.-Riverside. His dissertation research will focus on physiological adaptation of *P. maniculatus* to high altitude.

* * * *

Chromosome Nomenclature. We are still seeking a convenient way to symbolically present in tabular form the cytogenetic variation known within the genus *Peromyscus*. Oscar Ward has been working on this project. A scheme devised by William Kilpatrick is given on page 21 of this issue. We welcome modifications or suggestions, with view to arriving at a generally agreed upon system. Any ideas???

Sallie Whitmore at Research Triangle Institute in North Carolina has recently established a random bred colony of *Peromyscus* from animals obtained from the N.C. State University colony. She is currently running biochemical screens on their foundation stocks. She also reports a variant which converts the yellow hair pigment to white and has longer than normal guard hairs. A litter of three with the phenotype was born in the colony.

PHYLOGENETIC TREES. For the September issue of PEROMYSCUS NEWSLETTER we hope to include one or more phylogenetic trees reflecting the current thinking, be they phyletic or cladistic, about the proper alignment and evolutionary relationships within *Peromyscus* (*sensu lato* or whatever). These trees could be based on chromosomal, morphological, electrophoretic, DNA hybridization or other data. Ultimately, we would hope to have a consensus tree we could feature on the cover a few issues further down the road. Your contribution of a tree diagram to the next issue will be appreciated. It will be reproduced without modification.

.....

We plan to feature Lee R. Dice in our next "Peromyscus Pioneer" sketch. Many of us working with *Peromyscus* today are "academic children and grandchildren" of Dice. Any biographical material you may have to contribute to this sketch will be greatly appreciated. In particular we are interested in obtaining or reconstructing a list of Dice's numerous graduate students and the dates during which they worked with him.....

.....and speaking of Dice's former proteges, we recently learned that Dr. T. T. Liu who worked with Dice in the late 1940's and early 1950's is now Professor of Human Genetics at Fudan University at Shanghai. After Liu returned to mainland China in the 1950's his whereabouts was not generally known in this country. Much of Liu's *Peromyscus* work involved measuring genetic reproductive isolation, using *P. maniculatus* and *P. polionotus* hybridization as a model.

* * * * *

When is a lab animal not a lab animal? See Jack Cranford's entry (p. 27).

* * * * *

DEADLINE for entries in PEROMYSCUS NEWSLETTER Number Four is 31 July 87. PN #4 will be issued in September.

PEROMYSCUS STOCK CENTER

What is the Stock Center? The deer mouse colony at the University of South Carolina has been designated a genetic stock center under a grant from the Biological Resources Program of the National Science Foundation. The major function of the Stock Center is to provide genetically characterized types of *Peromyscus* in limited quantities to scientific investigators. Continuation of the center is dependent upon significant external utilization, therefore potential users are encouraged to take advantage of this resource. Sufficient animals of the mutant types generally can be provided to initiate a breeding stock. Somewhat larger numbers, up to about 50 animals, can be provided from the wild-type stocks. A user fee of \$5 per animal is charged and the user assumes the cost of air shipment. Animals lost in transit are replaced without charge. Tissues, blood, skins, etc. can also be supplied at a modest charge.

Stocks Available in the Center:

WILD TYPES	ORIGIN
<i>P. maniculatus bairdii</i> (BW Stock)	Closed colony bred in captivity since 1948. Descended from 40 ancestors wild-caught near Ann Arbor MI
<i>P. polionotus subgriseus</i> (PO Stock)	Closed colony since 1952. Derived from 21 ancestors wild-caught in Ocala Nat'l. Forest FL. High inbreeding coefficient.
<i>P. leucopus</i> (LL Stock)	Derived from 38 wild ancestors captured between 1982 and 85 near Linville NC. Third to fifth generations in captivity.
<i>P. maniculatus</i> X <i>P. polionotus</i> F ₁ Hybrids	Sometimes available.

MUTATIONS IN THE SOUTH CAROLINA STOCK CENTER:

<u>Coat Colors</u>	ORIGINAL SOURCE
Albino c/c	Sumner's albino deer mice (Sumner, 1922)
Black (Non-agouti) a/a	Horner's black mutant (Horner et al., 1980)
Blonde bl/bl	Mich. State colony (Pratt and Robbins, 1982)
Brown b/b	Huestis stocks (Huestis and Barto, 1934)
Dominant spotting S/-	Wild caught in Illinois (Feldman, 1936)
Gray g/g	Natural polymorphism. From Dice stocks (Dice, 1933)
Ivory i/i	Wild caught in Oregon. (Huestis, 1938)
Pink-eyed dilution p/p	Sumner's "pallid" deer mice. (Sumner, 1917)
Platinum pt/pt	Barto stock at U. Mich. (Dodson et al., 1987)
Silver si/si	Huestis stock. (Huestis and Barto, 1934)
White-belly non-agouti a ^w /a ^w	Egoscue's "non-agouti" (Egoscue, 1971)
Wide-band agouti A ^{nb} /-	Natural polymorphism. Univ. Michigan stock (McIntosh, 1954)
Yellow y/y	Sumner's original mutant. (Sumner, 1917)

Note: Some of the coat color mutations are immediately available only in combination with others. For example, silver and brown are maintained as a single "silver-brown" double recessive stock. Write the Stock Center or call (803) 777-3107 for details.

Other Mutants and Variants

ORIGIN

Alcohol dehydrogenase negative Adh ^o /Adh ^o	South Carolina BW stock. (Felder, 1975)
Alcohol dehydrogenase positive Adh ^r /Adh ^r	South Carolina BW stock. (Felder, 1975)
Epilepsy ep/ep	U. Michigan artemisiae stock. (Dice, 1935)
Flexed-tail* f/f	Probably derived from Huestis flexed-tail (Huestis and Barto, 1936)
Hairless-2 hre/hre	Egoscue's hairless. (Egoscue, 1962)
Juvenile ataxia ja/ja	U. Michigan stock. (VanOoteghem, 1983)

Enzyme variants. Wild type stocks given above provide a reservoir for several enzyme and other protein variants. See Dawson, et al. (1983).

*Available only on pink-eye dilution background.

Limited numbers of other stocks, species, mutants and variants are on hand, or under development, but are not currently available for distribution. For additional information or details about any of these mutants or stocks contact:

W. D. Dawson
Peromyscus Stock Center
Department of Biology
University of South Carolina
Columbia SC 29208
(803) 777-3107

The Advisory Committee for the Peromyscus Stock Center:

John C. Avise (University of Georgia)
Ira F. Greenbaum (Texas A and M University)
Clement L. Markert (North Carolina State University)
Joseph H. Nadeau (Jackson Laboratory)
Suellen Van Ooteghem (Wright State University)
Wallace D. Dawson (University of South Carolina)

PEROMYSCUS
PIONEER

Ralph R. Huestis

1892 - 1969

Among the more prominent early *Peromyscus* workers was Dr. Ralph R. Huestis of the University of Oregon. His genetic research with deermice bridges the period between F. B. Sumner's classic studies of the 1920s and the heyday of Lee R. Dice in the 1940s and 50s. From 1925 until his retirement in 1962 Huestis maintained a *Peromyscus* colony and conducted field and laboratory investigations of genetics, evolution and physiology of these animals. Several mutant varieties of deermice maintained today are directly descended from variants that Huestis first recognized.

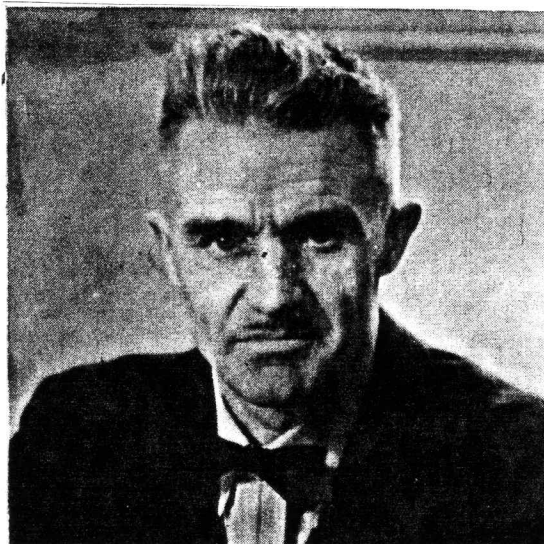
Ralph Huestis was born in Bridgewater, Nova Scotia, January 14, 1892. His father was a Methodist minister. When Huestis was about 10 years old his family moved to the small town of Red Deer, Alberta, where he spent much of his youth. He completed a program at McDonald Agricultural College in Quebec and in 1914 received his B.S. degree in agriculture from McGill University. Upon graduation he served four years during the First World War in veterinary service with the Canadian Expeditionary Force. At the conclusion of the war he married Geraldine Parke, a girl from his hometown, and shortly afterward entered graduate school at the University of California. He completed a masters degree in 1920, writing his thesis on *Drosophila* genetics which at that time was coming into vogue. While at Berkeley he became acquainted with Roy Clausen and Ernest Babcock who were active in plant genetics. At this point Huestis applied for and received an assistantship to work toward his Ph.D. with Francis Sumner at the Scripps Institution at LaJolla.

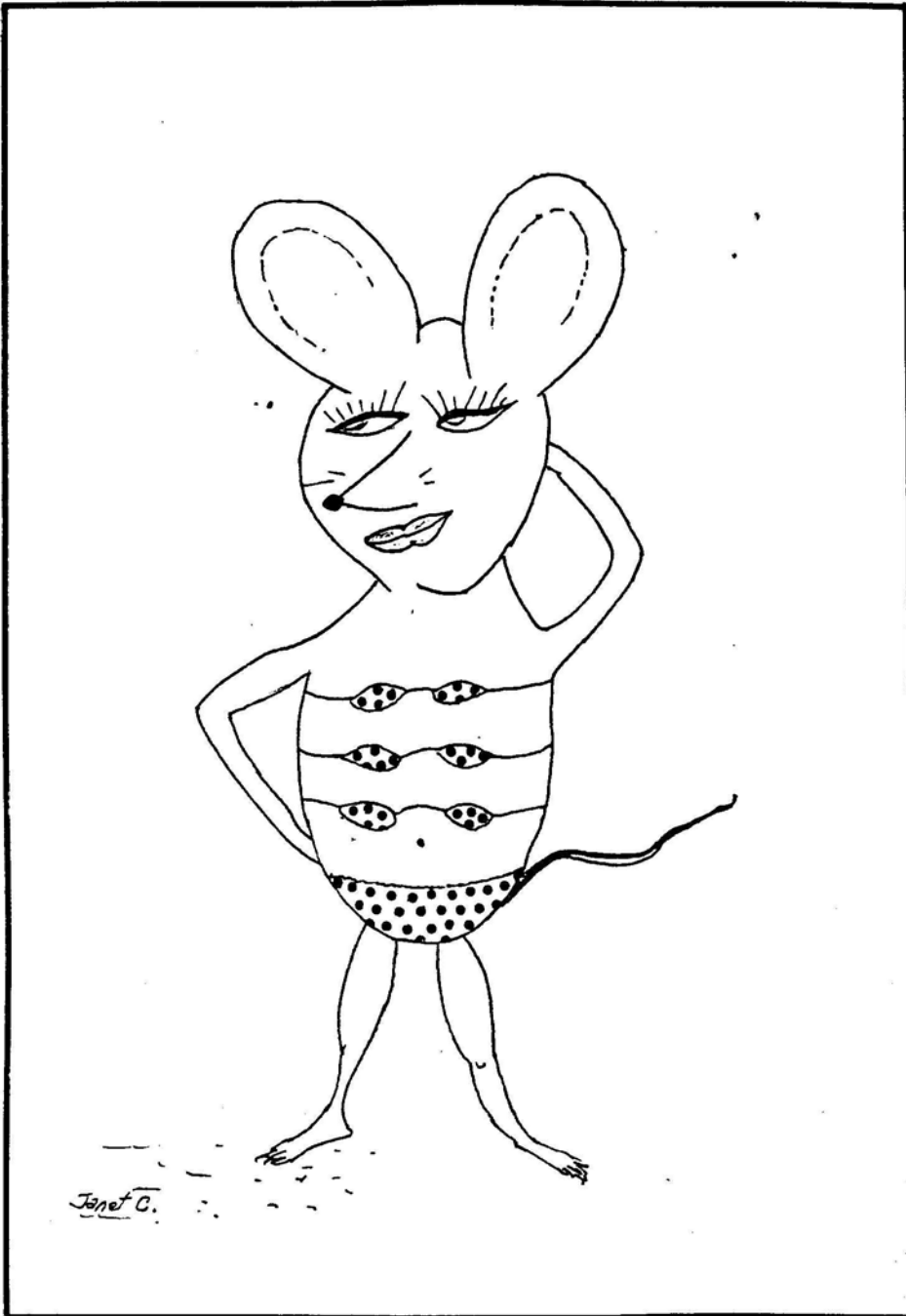
Sumner had been engaged in studies of environmental influences on inheritance of coat color and other traits in *Peromyscus maniculatus*, approaching the problem from a lamarkian point of view. Huestis undertook a parallel study using *P. eremicus*. Huestis' experiences with geneticists at Berkeley predisposed him toward a mendelian explanation for the variations observed in natural populations. He demonstrated (Huestis, 1925) that a multifactoral gene model was adequate to account for the inheritance of variations in *P. eremicus*. This may have been a major factor in influencing Sumner eventually to reject lamarkianism. (See PN #2)

In 1924 Huestis was awarded the Ph.D. degree from Berkeley, and soon accepted a position in the Zoology Department at the University of Oregon at Eugene where he spent the remainder of his academic career. At Oregon Huestis had a demanding teaching commitment, but he continued conducting investigations with *Peromyscus* and published several papers despite an environment where research was discouraged and he was provided little support. Some of his early work was in collaboration with Harry Yocum (1928), his department head. By the mid-1930s he was joined

by Elizabeth Barto, who became his assistant. During the years between 1934 and 1938 Huestis and Barto described several new mutations in *P. maniculatus*: silver, brown, ivory, flexed-tail, and tremor (Huestis and Barto, 1934; 1936a; 1936b; Huestis, 1938). They conducted the formal genetic analysis for each and added them to the store of variants in the Oregon deermouse colony, which also included descendents of Sumner's mutant types. Barto subsequently left to undertake Ph.D. studies at Michigan with Dice. By the 1940's Huestis, along with graduate students Victor Piestrak and Greta Lindstedt, had showed that the silver and flexed-tail loci were linked, further expanding the first known linkage group in *Peromyscus* (Huestis and Piestrak, 1942; Huestis and Lindstedt, 1946). In 1949 Ruth Willoughby Anderson joined Huestis as his graduate student. With Anderson he continued to discover mutations in *P. maniculatus*: heterochromia, cataract-webbed and spherocytosis (Huestis and Willoughby, 1950; Anderson and Burns, 1979; Huestis and Anderson, 1954). One of the new mutants, spherocytosis (originally called "inherited jaundice"), was of medical significance as a model of a similar human hereditary disorder and a series of papers authored by Huestis, Arno Motulsky and others followed (Huestis et al., 1956; Anderson et al., 1960). Thus late in his career Huestis achieved some note beyond his immediate field of mammalian genetics.

Ralph Huestis eventually, at age 60, became department head, a position he had acutely desired but vainly sought earlier in his career. He also acquired grant funding and other appurtenances which eased some of the pressures of earlier years. He continued to trap and breed deermice, ever alert for new variants. Several were discovered, but never reported including "curly vibrissae", "snub nose" (which he also called "Nixon nose"), "pectoral spot", "dunes ashy", and "spiral-tail". Soon after his retirement he dispensed his stocks to various other institutions, including the *Peromyscus* colony at the University of South Carolina. Dr. Huestis died February 25, 1969, at the age of 77. He was survived by his wife and four children.





PLAY MOUSE OF THE MONTH

GENETIC LOCI IN THE DEER MOUSE

(*Peromyscus maniculatus*)

Tables 1A through 1D list genetic loci described in *Peromyscus maniculatus* and other species of the *maniculatus*-group. This list is limited to loci for which formal genetic analysis of crosses has been accomplished and reported in the published scientific literature. Brief reports, such as abstracts or casual reports, as in newsletters, grant proposals, papers presented at meetings, etc. are not included in the citations. Several additional genetic loci are known and currently maintained, but have not yet been reported formally. *Peromyscus Newsletter* will not usurp the prerogative of publication for previously undescribed variants. Reference to undescribed mutations may appear in some of the contributed entries, however.

Table 2 lists presumptive enzyme and other protein loci identified as variants or polymorphisms in natural populations of *P. maniculatus* and its sibling species. These are loci which may or may not have been subjected to formal mendelian analysis. Reports of monomorphic loci are not included. As in the case of Table 1, only variants reported in full-length articles in the scientific literature are included.

The genetic nomenclature of *Peromyscus* has not been standardized. In designating gene loci we have used the symbols given by the original investigator, unless these have been superceded by subsequent reports, in which case we have used the most recent revision. Exceptions to this rule have been made 1.) where there is a clear homology with *Mus*, in which case the laboratory mouse symbol has been adopted; 2.) where a variant has been shown to be allelic with a previously reported gene, in which case a locus symbol is reduced to an allelic symbol; 3.) where two authors have used the identical symbol for different loci, in which case we have given priority to the first reported, and devised a modified designator for the other. Variants identified by molecular genetic techniques will be updated in PN #4.

References cited in the tables are available in a list of *Peromyscus* genetic literature compiled by Dr. Bruce Buttler, Biology Department, Canadian Union College, College Heights, Alberta, Canada, TOC OZO.

Any omissions or corrections should be called to our notice. Tables 1 and 2 will be updated annually in the March issues of *Peromyscus Newsletter*.

TABLE 1A
Coat color and pattern, and eye pigmentation variants

Name of locus and alleles	Symbol	Mode of inheritance	Linkage group	Original description and analysis	Collateral descriptions, interactions, and recurrences	Recombination reported
AGOUTI			III			
Wide-band agouti	<i>A^{Nb}</i>	dominant		McIntosh (1956a)	Blair (1947) as "buff"	Clark (1938) as "buff"; Barto (1956)
White belly non-agouti	<i>a^w</i>	recessive		Egoscue (1971)		
Non-agouti (Black)	<i>a</i>	recessive		Horner <i>et al.</i> (1980)		
BROWN			II			
	<i>b</i>	recessive		Huestis and Barto (1934)	Blair (1947); McIntosh (1956a)*; Dawson <i>et al.</i> (1969)	Huestis and Barto (1934); Blair (1947); Barto (1955, 1956); McIntosh (1956a)
Orange-tan	<i>b^{ot}</i>	recessive		Egoscue and Day (1958)		
BLOND				Pratt and Robbins (1982)		
ALBINO			I			
	<i>c</i>	recessive		Sumner (1922)		Sumner (1922); Clark (1936, 1938); Feldman (1937); Barto (1942a); Huestis and Lindstedt (1946); Huestis (1946)
COLORLESS HAIR TIP*	<i>ctp</i>	recessive		Bowen and Dawson (1969)	Bowen (1968)	
DILUTE*			II			
	<i>d</i>	recessive		Dice (1933)		Clark (1938); Barto (1942a, 1956); McIntosh (1956a)
GRAY						
	<i>g</i>	recessive		Dice (1933)	Clark (1938); Blair (1947); McIntosh (1956a)	Blair (1944, 1947)
IVORY						
	<i>i</i>	recessive		Huestis (1938)	Clark (1938)	Barto (1942a; 1956); McIntosh (1956a)
PINK-EYED DILUTION			I			
	<i>p</i>	recessive		Sumner (1917)	Barto (1942b)	Sumner (1922); Clark (1936, 1938); Feldman (1937); Snyder (1980a)
PLATINUM				Dodson <i>et al.</i> (1987)		
RED EYE (Heterochromia)				Huestis and Willoughby (1950)		
DOMINANT SPOT (Whiteface)				Feldman (1936)	Maddock (1966)	Feldman (1937)
SILVER			I			
	<i>si</i>	recessive		Huestis and Barto (1934)		Huestis and Barto (1934); Huestis and Piestrak (1942); Huestis and Lindstedt (1946); Barto (1956)
WHITE CREEK				Blair (1944)	Bowen and Dawson (1977)	Blair (1944)
WHITESIDE*				McIntosh (1956b)		
YELLOW				Sumner (1917)	Sumner and Collins (1922); McIntosh (1956a)	Sumner (1922); Feldman (1937); (1956a); Barto (1956)
COMPLEXLY INHERITED TRAITS:						
Minor white spotting (star, splash, etc.)	<i>p-1</i> ; <i>p-2</i>	recessive incompletely penetrant		Feldman (1936)	Sumner (1932); Barto and Huestis (1933)	
Grizzled*	"g"	"complex dominant"		Sumner (1932)		
Coat pattern in <i>P. polionotus</i>						
Pointed A	<i>Pa</i>	dominant	VII	Bowen and Dawson (1977)	Bowen (1968)	Bowen and Dawson (1977)
Pointed B	<i>Pb</i>	dominant	VII			
Tapered	<i>Tp</i>	dominant				
Coat pattern modifiers in <i>P. polionotus</i>						
Squared modifier	<i>Rs</i>	incompletely dominant		Bowen and Dawson (1977)		
Tapered modifier	<i>Rt</i>	dominant				

*No longer known to be in existence.

TABLE 1B
Integumentary, skeletal and metabolic variants

Name of locus and alleles	Symbol	Mode of inheritance	Linkage group	Original description and analysis	Collateral descriptions, interactions, and recurrences	Recombination reported
CATARACT-WEBBED (syndactyly)	<i>cw</i>	recessive		Anderson and Burns (1979)		
FLEXED-TAIL	<i>f</i>	recessive	I	Huestis and Barto (1936a)		Huestis and Barto (1936a); Huestis and Piestrak (1942); Huestis and Lindstedt (1946); Huestis (1946); Huestis, <i>et al.</i> (1956); Barto (1956)
HAIRLESS-1	<i>hr-1</i>	recessive		Sumner (1924)		Sumner 1924, 1932; Feldman (1937); Clark (1938); Barto (1942a, 1955, 1956); McIntosh (1956a)
HAIRLESS-2	<i>hr-2</i>	recessive		Egoscue (1962)		
NUDE* (post-juvenile)	<i>n</i>	recessive		Clark (1938)	Barto (1942a)	
SPHEROCYTOSIS (Hereditary jaundice)	<i>sph</i>	recessive		Huestis and Anderson (1954)	Huestis, <i>et al.</i> (1956); Motulsky, <i>et al.</i> (1956)	Huestis, <i>et al.</i> (1956)

No longer known to be in existence.

TABLE 1C
Behavioral and Neurological Variants

Name of locus and alleles	Symbol	Mode of inheritance	Linkage group	Original description and analysis	Collateral descriptions, interactions, and recurrences	Recombination reported
BOGGLER	<i>bg</i>	recessive		Barto (1955)	Vandermerer and Barto (1969)	Barto (1955)
EPILEPSY (EP)	<i>ep</i> , (<i>e</i> , <i>v</i> ₂)	recessive		Dice (1935)	Clark (1938); Watson (1939); Chance & Yaxley (1950); Barto (1954, 1956)	Watson (1939); Barto (1956)
JUVENILE ATAXIA	<i>ja</i>	recessive		Van Ooteghem (1983)		
SPINNER*	<i>sp</i> (<i>v</i> ₃)	recessive		Watson (1939)	Barto (1954)	
TREMOR*	<i>t</i>	recessive		Huestis and Barto (1936b)		
WALTZER* (waltzing in <i>bairdii</i>)	<i>v</i> (<i>w</i>)	recessive	III	Dice (1935)	Clark (1938); Watson (1939); Barto (1942a, 1954, 1956); McIntosh (1956)	

*No longer known to be in existence.

Table 1D

Biochemical and immunological genetic variants formally analyzed in the *Peromyscus maniculatus* species group

Name of Locus	Allelic designation	Linkage group	Description and formal analysis	Recombination Reported
ALCOHOL DEHYDROGENASE (liver)	$Adh-1^f$ $Adh-1^s$ $Adh-1^o$	VI	Felder (1975); Burnett and Felder (1978a; 1978b)	Dawson <u>et al.</u> (1983)
ALBUMIN (serum)	Alb^{100} Alb^{96} Alb^{86}	VI	Brown and Welser (1968); Jensen and Rasmussen (1971)	Dawson (1982); Dawson <u>et al.</u> (1983)
AMYLASE (salivary)	$Amy-1^a$ $Amy-1^b$ $Amy-1^c$	VI	Evans <u>et al.</u> (1977)	Dawson <u>et al.</u> (1983)
ESTERASE (erythrocytic)	$Es-1^o$ $Es-1^a$ $Es-1^b$	IV	Randerson (1965); Van Deusen and Kaufmann (1978)	Randerson (1973)
ESTERASES (tissue and serum)	Es-2 through Es-7 (Symbols not standardized)		Rasmussen and Jensen (1971); Dawson (1982); Gill (1976); Baccus <u>et al.</u> (1980)	Dawson (1982)
GLUTAMATE OXALOACETATE TRANSAMINASE (soluble)	$Got-1^a$ $Got-1^b$ $Got-1^c$		Gill (1976)	Dawson <u>et al.</u> (1983)
AUTOSOMAL GLUCOSE-6-PHOSPHATE DEHYDROGENASE (soluble)	$G6pd-1^a$ $G6pd-1^b$		Shaw and Barto (1965); Shaw (1966)	
α -GLYCEROPHOSPHATE DEHYDROGENASE (tissue)	$Gpd-1^a$ $Gpd-1^b$		Gill (1976)	
HEMOGLOBIN - ALPHA TYPE GLOBINS (Duplicated locus)	$Hba_1^f = (Hb^f) = (Hb I^a)$ Hba_0 $Hbc_1 = (Hb^o) = (Hb I^o)$ Hbc_2 $Hbc = (Hb^f)$		Thompson <u>et al.</u> (1966) Rasmussen <u>et al.</u> (1968) Jensen <u>et al.</u> (1976) Maybank and Dawson (1976) Snyder (1978; 1980b)	
HEMOGLOBIN - BETA TYPE GLOBINS (Tripllicated locus)	Hbb^1 Hbb^0 Hbb^1 or $Hbb-b1$ Hbb^0 or $Hbb-b2$ Hbb^1 or $Hbb-b3$	I	Snyder (1978; 1980b) Padgett <u>et al.</u> (1987)	Snyder (1980a)
HAPTOGLOBIN (serum)	Hpt^1 Hpt^2		Rasmussen (1968); Griswold and Dawson (1971)	
IMMUNOGLOBIN (7S _{Y1})	Ig^f Ig^s Ig^r		Coe (1972)	
LACTATE DEHYDROGENASE A SUBUNIT (tissue)	$Ldh-A^a$ $Ldh-A^b$		Cattanach and Perz (1969)	
LACTATE DEHYDROGENASE B SUBUNIT (tissue)	$Ldh-B^f$ $Ldh-B^s$		Shaw and Barto (1963)	
LEUCINE AMINO PEPTIDASE (serum)	$Lap-1^a$ $Lap-1^b$	V	Dawson (1982)	Dawson (1982); Dawson <u>et al.</u> (1983)
SUPEROXIDE DISMUTASE	$Sod-1^J = (Ng^J)$ $Sod-1^N = (Ng^N)$ $Sod-1^M = (Ng^M)$		Birdsall <u>et al.</u> (1970)	
6-PHOSPHOGLUCONATE DEHYDROGENASE (tissue)	$6-Pgd^a$ $6-Pgd^b$		Gill (1976)	Dawson <u>et al.</u> (1983)
PHOSPHOGLUCOMUTASE-1 (tissue)	$Pgm-1^a$ $Pgm-1^b$		Gill (1976)	
PHOSPHOGLUCOMUTASE-4 (tissue)	$Pgm-4^a$ $Pgm-4^b$ $Pgm-4^c$		Gill (1976)	
ERYTHROCYTIC ANTIGEN	Pm^A Pm^B Pm^C Pm	IV	Rasmussen (1961) Savage and Cameron (1971)	Randerson (1973)
TRANSFERRIN (serum)	$Trf^a = (Trf^J)$ Trf^c Trf^e Trf^f Trf^M	V	Rasmussen and Koehn (1966) Biggers and Dawson (1971) Griswold and Dawson (1971) Canham <u>et al.</u> (1970)	Dawson (1982); Dawson <u>et al.</u> (1983)

Table 2. VARIANT PROTEIN LOCI REPORTED IN NATURAL POPULATIONS
OF MEMBERS OF THE PEROMYSCUS MANICULATUS SPECIES GROUP

Protein	Locus Symbol	Species	References
ALBUMIN	A1b	<i>P. maniculatus</i> <i>P. polionotus</i>	Rasmussen (1970) Jensen and Rasmussen (1971) Selander et al. (1971) Biggers and Dawson (1971) Loudenslager (1978) Baccus et al. (1980)
ALCOHOL DEHYDROGENASE	Adh-1	<i>P. maniculatus</i> <i>P. melanotis</i>	Avise et al. (1979) Baccus et al. (1980)
AMYLASE	Amy-1	<i>P. maniculatus</i>	Aquadro and Patton (1980)
ESTERASE	Es-1 Es-2 Es-3 Es-4 Es-5 Es-6 Es-7 Es-8	<i>P. maniculatus</i> <i>P. polionotus</i>	Rasmussen and Jensen (1971) Selander et al. (1971) Peck and Biggers (1975) Gill (1976) Loudenslager (1978) Foltz (1981)
GLUTAMATE OXALOACETATE TRANSAMINASE	Got-1	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. melanotis</i>	Selander et al. (1971) Gill (1976) Loudenslager (1978) Avise et al. (1979) Baccus et al. (1980)
GLUCOSE 6-PHOSPHATE DEHYDROGENASE	G6pd-1 (H6pd-1)	<i>P. maniculatus</i>	Shaw and Barto (1965) Loudenslager (1978)
κ-GLYCEROPHOSPHATE DEHYDROGENASE	Gpd-1	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. oreas</i>	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979)
HAPTOGLOBIN	Hpt	<i>P. polionotus</i>	Peck and Biggers (1975)
HEMOGLOBIN	Hba Hbb	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. melanotis</i>	Thompson et al. (1968) Ahl (1968) Foreman (1968) Rasmussen et al. (1968) Rasmussen (1970) Selander et al. (1971) Snyder (1977, 1980) Loudenslager (1978) Avise et al. (1979) Chappell and Snyder (1984)
ISOCITRATE DEHYDROGENASE	Idh	<i>P. maniculatus</i> <i>P. oreas</i> <i>P. polionotus</i> <i>P. sejugis</i>	Mascarello and Shaw (1973) Baccus et al. (1980) Avise et al. (1974)
LACTATE DEHYDROGENASE	Ldh-1 Ldh-2	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. melanotis</i>	Selander et al. (1971) Avise et al. (1979)
MALATE DEHYDROGENASE	Mdh-1 Mdh-2	<i>P. polionotus</i>	Selander et al. (1971)
PEPTIDASE	Pep-1 (Pep-B)	<i>P. maniculatus</i> <i>P. melanotis</i>	Avise et al. (1979) Baccus et al. (1980)
PHOSPHOGLUCOMUTASE	Pgm-1 Pgm-2 Pgm-3 Pgm-4	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. melanotis</i>	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979)
6-PHOSPHOGLUCONATE DEHYDROGENASE	Pgd-1	<i>P. maniculatus</i> <i>P. polionotus</i> <i>P. oreas</i>	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979) Baccus et al. (1980) Foltz (1981)
PHOSPHOGLUCOSE ISOMERASE	Pgi-1	<i>P. polionotus</i> <i>P. melanotis</i>	Selander et al. (1971) Avise et al. (1979) Foltz (1981)
SORBITOL DEHYDROGENASE	Sdh	<i>P. maniculatus</i>	Baccus et al. (1980)
TRANSFERRIN	Trf	<i>P. maniculatus</i> <i>P. polionotus</i>	Rasmussen (1970) Biggers and Dawson (1971) Selander et al. (1971) Gill (1976) Redfield (1976) Loudenslager (1978) Avise et al. (1979) Baccus et al. (1980) Foltz (1981)
Miscellaneous Non-specific Proteins		<i>P. maniculatus</i>	Mascarello and Shaw (1973) Gill (1976)

Reference list is available from Dr. Bruce Buttler, Div. Natural & Physical Sciences, Canadian Union College, 400 College Heights, Alberta T0C 0Z0.

GENETIC LINKAGE IN PEROMYSCUS MANICULATUS

Linkage data for the deermouse (*Peromyscus maniculatus*) collected before 1972 are summarized by Robinson (1964, 1972). Several additional linkages have been added in the interim (Bowen and Dawson, 1977; Dawson, 1982; Dawson et al., 1983; Snyder, 1980). The figure on the cover is a representation of the current status of the linkage map for the deermouse and its sibling species *P. polionotus*. Six linkage groups are now established by formal genetics and another is tentative. An additional linkage, Es-5 - Es-6, by homology with *Mus* will probably map to Group IV (Dawson, 1982) and is designated IVa in the table.

The order of loci in Group I was reported informally by Huestis and Silliman in an unpublished communication, according to Robinson (1972), and has been partially confirmed by Dodson (unpub.). Linkage of *Trf* and *Lap* is tentative (Dawson, 1982), but is homologous with a similar linkage in *Mus*. The *Pep-2* locus is provisionally assigned to Group VI proximal to *Alb*, but has not been mapped further (Dawson et al., 1983).

Positive, but not significant, lod scores suggesting possible linkage between the gene pairs *Adh* - *6Pgd*, *Adh* - *Got-1*, *Adh* - *ldh*, *Alb* - *Pept-1*, *Alb* - *Sdh* and *Est-4* - *Sdh*, respectively, were reported by Baccus et al. (1980). Subsequent information indicates that *Adh* and *Got-1* are independent, as are the *Alb* and *Sdh* loci (Dawson et al., 1983).

The *Hbe* locus probably represents a triplicated beta globin site, according to Snyder (1980). Unpublished data from Snyder maps the position of the *Gpi-1* and *Hbe* loci relative to the albino (*c*) and pink-eyed dilution (*p*) loci. By restriction mapping and DNA sequencing Padgett et al. (1987) demonstrated that there are three tandemly linked adult beta globin loci (*Hbb-b1*, *Hbb-b2* and *Hbb-b3*) homologous with *Mus* adult beta globins. In addition there is an epsilon globin locus (*Hbb-y*), two tandem gamma globin loci (*Hbb-bh0* and *Hbb-bh1*) and a pseudogene (*Hbb-bh3*) by homology with *Mus*. Also in Linkage Group I there may be a duplication, *f'*, closely linked to the *f* locus (Silliman, unpub.)

Two significant markers on the *Peromyscus* linkage map, *d* and *v*, have become extinct in laboratory stocks of deermice. The "flexed tail" trait which now occurs in a laboratory stock may not be identical by descent with the original trait used in early linkage studies, but it maps to the same location in Group I.

The chromosome number of all *Peromyscus* species is $2N = 48$. None of the linkage groups have been assigned to chromosomes.

For references to tests of recombination, but where linkage was not demonstrated, refer to Tables 1A through D on pp. 14-16.

MAPPED LOCI IN PEROMYSCUS MANICULATUS

Gene Symbol	Name of Locus	Linkage Group	Reference
AN ^b	Agouti	III	McIntosh (1956)
Adh-1	Alcohol dehydrogenase (liver)	VI	Dawson et al. (1983)
Alb	Albumin (serum)	VI	Dawson et al. (1983)
Amy-1	Amylase (salivary)	VI	Dawson et al. (1983)
b	Brown	II	McIntosh (1956)
c	Albino	I	Sumner (1922), Clark (1936, 1938), Huestis and Lindstedt (1946)
d	Dilute	II	McIntosh (1956)
Es-1	Esterase-1 (erythrocytic)	IV	Randerson (1973)
Es-5	Esterase-5 (kidney)	IVa	Dawson (1982)
Es-6	Esterase-6 (kidney)	IVa	Dawson (1982)
f	Flexed tail	I	Huestis and Plestrak (1942), Huestis and Lindstedt (1946)
Gpi-1	Glucose phosphate isomerase (erythrocytic)	I	Snyder (1980)
Hbb	Beta globin (hemoglobin)	I	Snyder (1980)
Lap	Leucine aminopeptidase (serum)	V	Dawson (1982)
p	Pink-eyed dilution	I	Sumner (1922), Clark (1936, 1938), Snyder (1980)
PA	Pointed rump pattern A	VII	Bowen and Dawson (1977)
P _B	Pointed rump pattern B	VII	Bowen and Dawson (1977)
Pep-2	Tripeptidase (erythrocytic)	VI ?	Dawson et al. (1983)
Pm	Erythrocytic antigen	IV	Randerson (1973)
sb	Snub nose	I	Robinson (1972)
si	Silver	I	Huestis and Plestrak (1942), Huestis and Lindstedt (1946)
Trf	Transferrin (serum)	V	Dawson (1982)
v	Waltzer	III	McIntosh (1956)

For reference citations see Buttler's "Bibliography of Peromyscus (Rodentia) Genetics"

P E R O M Y S C U S C Y T O G E N E T I C S

Chromosome nomenclature. The standardized G-banded karyotype of *Peromyscus*, published a decade ago (Committee, 1977), has been instrumental in advancing our understanding of cytogenetic and evolutionary relationships both within the genus and between other rodent genera. As more has been learned about the chromosomes of *Peromyscus* species, species groups and subgenera, it has become apparent that some revision and a system for an expanded nomenclature of the standardized karyotype is needed. While major bands, both light and dark, are generally sufficient for chromosome identification, they are usually inadequate for precise determination of chromosomal inversion break points. As with the human karyotype, techniques for the production of high resolution G-bands result in data which needs to be incorporated into the existing system with a minimum of amendment. Scott Gunn (U.S.D.A.) and Ira Greenbaum (Texas A&M) have initiated the preparation of a revised standard karyotype and nomenclature system. Their challenge is to address these and other problems of *Peromyscus* chromosomes and to provide an open-ended system of band designation. Gunn and Greenbaum have recruited the assistance of a small group of the original standardization committee. In the meantime, individuals working with G-banded *Peromyscus* karyotypes may obtain a draft copy of the preliminary idiogram for comments and criticism, from Ira (Department of Biology, Texas A&M University, College Station, TX, 77843-3258).

Chromosomal Homologies. The table on p. 21 submitted courtesy of C. William Kilpatrick (University of Vermont) is based on G- and C-band data taken from recent literature. This table was prepared by Kilpatrick with the aid of D. B. Hoagland, P. D. Rennert and D. Werbitsky. The table is presented with the knowledge that while chromosomal data have limitations in their application to systematic studies (reversals, convergences, etc.) they necessarily complement genic and morphological data in approaching a functional classification. With continued chromosomal analyses, changes in the table will undoubtedly occur; meanwhile, the data should serve as points of reference and discussion. Your comments and criticisms are invited in the form of letters to the editor (O.G.W.) and will be published as such.

* * *

Table 1.--Chromosome homology among 52 species of neotomine-peromyscine rodents. An A indicates a mostly euchromatic acrocentric chromosome, a B equals biarmed chromosome (resulting from pericentric inversion), a C indicates addition of heterochromatin to form entire short arm of biarmed chromosome, a D indicates a pericentric inversion with addition of heterochromatin to telomere of short arm, an E indicates a euchromatic addition, a TF indicates a tandem fusion, and an F equals a fragment or segment which is equivalent.

TAXA	Chromosome																							Reference			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		Y		
Haplomyomys																											
<i>P. aremicus</i>	B*	C	C	C	C	D ¹ ₂	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	B	1,2,3		
<i>P. merriami</i>	B	C	C	C	C	B ²	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	D	B	3		
<i>P. californicus</i>	B	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3	
Peromyscus																											
<i>P. hooperi</i> species group																											
<i>P. hooperi</i>	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	28	
<i>P. boylii</i> species group																											
<i>P. boylii</i>	B*	A or B	A	A	A	A	A	A	A/B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3,4,5,6,7	
<i>P. attwateri</i>	B	B	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3	
<i>P. pectoralis</i>	B	B	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3	
<i>P. beatae</i>	A/B	A/B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A/B	B	25	
<i>P. truei</i> species group																											
<i>P. truei</i>	B ²	B	B	A	A	B	A	A	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	B	B	A	3, 26
<i>P. gratus</i>	B ²	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	26	
<i>P. difficilis</i>	B	B	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3	
<i>P. crinitus</i> species group																											
<i>P. crinitus</i>	B*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	1,2	
<i>P. melanophrys</i> species group																											
<i>P. melanophrys</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	tiny 8	
<i>P. perfulvus</i>	B	B	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	tiny 9,10	
<i>P. leucopus</i> species group																											
<i>P. leucopus</i>	B	B*	B	A	A/B	B	A	A	B	A	A/Da	C	A	A	A	A	C/Da	A	A/B	Da	D	D	D	D	D	3,11	
<i>P. gossypinus</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	Da	D	D	7	
<i>P. maniculatus</i> species group																											
<i>P. maniculatus</i>	B	B	B	A	B	A/B	A	A	B	B	B	A	B/O	A/B	B	C	A/C	A/C	C	B	C	B	B	12,13,30			
<i>P. polionotus</i>	B	B	B	A	B	A	A	B	A	A	A	A	A	B	A	B/D	A	A/C	A/C	B	A	B	B	B	13		
<i>P. melanotis</i>	B	B	B	A	A	B ⁴	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	B	A	B	12	
<i>P. sitkensis</i>	B	B	B	A/C	B	C/D*	A/B	C	B	B	D	C	B	B	C	C	C	D	D*	B	C	D	B	B	14		
<i>P. oreas</i>	B	B	B	A/C	B	A	A/B	A/C	B	B	D	A/C	B	B	V	V	A/C	C	D	B	C	B	B	B	30		
<i>P. mexicanus</i> species group																											
<i>P. mexicanus</i>	B	B	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>P. nudipes</i>	B	B	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	9	
<i>P. guatemalensis</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>P. gymnotis</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>P. yucatanicus</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>P. zarhynchus</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>P. furvus</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	27	
<i>P. megalops</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	27	
<i>P. melanurus</i>	B	B	B	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	27	
<i>P. ochraventer</i>	B	B	B	A	A	B	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	3	
<i>Osgoodomys banderanus</i>																											
<i>Osgoodomys banderanus</i>	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	5	
<i>Isthmomyia pirrensis</i>	B*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	C	A	A	C	A	B	C	C	9		
<i>Habromys lepturus</i>	B	B	B	A	B	B	B	A	B	B	A	A	A	B	A	A	A	A	A	A	A	A	B	B	5		
<i>Megadontomys thomasi</i>	B	B	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	15	
<i>Podomys floridanus</i>	B	B	B	A	A	B	A	A	B	A	B	A	A	A	A	A	A	A	A	A	A	A	B	B	7		
<i>Neotomodon alstoni</i>																											
<i>Neotomodon alstoni</i>	B	B	B	A	A	B	B	A	B	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	16	
<i>Onychomys arenicola</i>																											
<i>Onychomys arenicola</i>	B	C	C	C	C	C	C	A	B	A	C	A	A	C	A	A	A	A	B	A	A	A	B	B	17		
<i>O. torridus</i>	B	A/C	A/C	A/C	A	A	A	B	A	A/C	C	C	C	A/C	C	C	C	C	B	C	C	B	B	B	17,18		
<i>O. leucogaster</i>	B	C	C	C	C	C	C	C	B	C	C	C	C	C	C	C	C	C	C	C	C	B	B	B	17		
<i>Sitomys taylori</i>																											
<i>Sitomys taylori</i>	Aq	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	16	
<i>Nelsonia neotomodon</i>																											
<i>Nelsonia neotomodon</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	19	
<i>Reithrodontomys fulvescens</i>																											
<i>Reithrodontomys fulvescens</i>	Aq	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	20	
<i>R. montanus</i>	C	C ¹	E&C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	20,21		
<i>R. raviventris</i>	C	C ²	E	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	C	E	E	E	21		
<i>R. megalotis</i>	BorE	E	E	E	E	A/B	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	C	C	C	21		
<i>R. sumichrasti</i>	C	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	E	C	C	C	21		
<i>R. creper</i>																									20		
<i>R. mexicanus</i>																									20		
<i>Ochrotomys nuttalli</i>																											
<i>Ochrotomys nuttalli</i>		A	F	F		A				TF-1				TF-1												22	
<i>Scotinomys xerampelinus</i> ^a																											
<i>Scotinomys xerampelinus</i> ^a	F	F			F			B			B	B				A			B						20,21,22Y	29	
<i>Neotoma micropus</i>																											
<i>Neotoma micropus</i>	Aq	A	C	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	B	B	23,24	

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* Insertion of interstitial heterochromatin

^a Possible insertion of NOR₃

a. Several homologies were observed with *Ochrotomys* which were not shared with other peromyscines.

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C O N T R I B U T I O N S

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In the course of study of *Mus domesticus* demes in southwestern Ontario (Baker and Petras, 1986) observations were made on *Peromyscus*. Twenty-nine *P. maniculatus* escaped from intensively studied corn cribs. We saw nestling *P. maniculatus*, as well. Of more than 400 cribs which were observed being emptied over a fifteen year period, 15% had *P. maniculatus*. For the two most abundant species there was a significant difference in numbers trapped in cultivated fields and non-cultivated areas. 155 *P. maniculatus* and 97 *M. domesticus* were captured in cultivated fields, while 19 *P. maniculatus* and 54 *M. musculus* were taken in non-cultivated locations. One *P. leucopus* was trapped in a non-cultivated area. Multiple captures of different species were rare: *M. domesticus* was taken together with *P. maniculatus* only three times in fields and other open areas. While other species may occur with *M. domesticus*, they probably have little influence on movements of *M. domesticus*. The distribution of *P. maniculatus*, as well as *M. domesticus*, can be equally well explained by habitat preference (Whitaker, 1967) or competition (Sheppe, 1967).

* * *

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Our work with the genus *Peromyscus* has involved a study of a contact zone between two cytotypes of *P. leucopus*. As outlined below, the project is broadly based and involves cooperation among scientists from Texas Tech, Harvard, and Texas A&M. The two chromosomal races, which hybridize in central Oklahoma, can be recognized by presumed pericentric inversions in chromosomes, 5, 11, and 20. Previous studies by Stangl and Baker (1984), Stangl (1986), and Nelson et al. (1987) have defined the boundaries and limits of the contact zone using chromosomal, electrophoretic markers and mitochondrial DNA (mtDNA) marker.

Currently, our studies involve: 1) samplings of two transects across the zone. Each transect will consist of samples of at least ten localities with a goal of 500 wild-caught mice per transect. One transect will be a resampling of localities from the previous studies, and the second transect will be a

roughly a 45 degree angle to the first and will cross the first near the center of the hybrid zone. All mice collected are being G- and C-band karyotyped, studied at approximately 40 electrophoretically detectable loci, and used in a morphological analysis. An analysis of nuclear and mitochondrial DNA will be conducted on a subset of this sample. 2) At two localities near the center of the zone where all or nearly all individuals are of hybrid origin, samples of 100 or more individuals (total of 200) will be collected during a single collecting period. These two samples will be used to test for linkage disequilibrium and Hardy-Weinberg equilibrium. Ribosomal DNA and mtDNA genotypes will be examined for all 200 individuals from these hybrid samples. 3) We will study the magnitude of negative heterotic effect through two independent data sets, including relative reproductive success of wild-caught females, and flow cytometry studies of DNA content of sperm. 4) We will analyze skeletal morphometrics across the zone and investigate correlations among chromosomal, genic, mtDNA, and morphometric characteristics.

Researchers working on the project from Texas Tech University include Robert J. Baker and Ronald K. Cheeser (co-P.I.'s for a grant from the National Science Foundation), as well as Calvin A. Porter and Robert D. Bradley (Ph.D. graduate students working as research assistants on the NSF grant). Also collaborating on the project are Dr. Rodney L. Honeycutt and Kimberlyn Nelson of Harvard University. Nelson is the recipient of a NSF Dissertation Improvement Grant which will be used to fund the mtDNA portion of the project and she will use the mtDNA study on the *P. leucopus* zone as part of her Ph.D. dissertation at Harvard. Kim Nelson has developed techniques which permit examination of the mtDNA from frozen samples of muscle or liver and the first manuscript on the result of this method has been accepted by *Evolution* (Nelson et al., 1987). Flow cytometry work on DNA content of sperm will be conducted by Dr. John Bickham, Texas A&M University, who is also a collaborator on the NSF proposal.

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We began a project in May, 1985 to examine the spatial relationships, accompanying microhabitat affinities, and differential use of the habitat of three rodents - *Peromyscus leucopus*, *P. maniculatus*, and *Clethrionomys gapperi* - in local sympatry in western Maryland. We are interested in the interactions of these common eastern mammals as they relate specifically to ecological and temporal isolation. The potential for coexistence of these species on our wooded study site is great because 76% of the substrate is covered by rock, providing abundant potential ground-based cover, refuges, and nest sites. The site supports permanent populations of all three species.

We have data on over 2500 captures from nearly two years of periodic live trapping on a one-hectare grid. The population of *P. leucopus* has remained consistently relatively high while that of *P. maniculatus* has fluctuated seasonally. Generally, there have been fewer *Clethrionomys* on the site than either *Peromyscus*.

Preliminary analysis has revealed distinct differences in microhabitat associations between the two *Peromyscus* that accompany negative spatial association of these species at ground level. *Peromyscus maniculatus* and *Clethrionomys* exhibit positive spatial association along the substrate and similarities in microhabitat affinities. We continue to collect and analyze data and plan to report more details of our understanding of the spatial dynamics of the three rodents in April at the ASB meeting in Athens and June at the ASM meeting in Albuquerque.

* * *

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I am in the process of building up a lab stock of *Peromyscus boylii* and *P. maniculatus* for studies of species recognition, and the roles of learning and instinct in the development of a species identity. We have developed a computer interfaced infrared photodetector system for continuously monitoring the location of 3 mice; a test mouse in a set of 3 chambers, and 2 stimulus mice, each in a separate chamber. This system could be modified for any situation requiring monitoring of the location and movements of one or more animals, as long as the animals are in separate cages. Our system uses Commodore 64 computers.

* * *

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Previous studies have demonstrated genetically based reproductive differences between two geographically separated populations of adult *Peromyscus leucopus*. Adult Georgia (GA) mice do not regress gonadal function under short day photoperiod (9:15, light:dark) whereas, adult Connecticut (CT) mice do regress gonadal function under short day treatment. The CT reproductive strategy conserves reproductive energy expenditures needed for basic survival in harsh CT winter conditions, while GA mice can reproduce all year in mild southern climates.

Currently, we are examining reproductive strategies concerning pubertal development in these two populations. We find that CT juveniles do delay the onset of puberty under a number of conditions mimicking the onset of winter in nature. In CT *P. leucopus* males, short day photoperiod from birth or 25 days of age delays reproductive maturation (as estimated from testes length, testes weight, and seminal vesicle weight) for about 26 weeks. Females also respond by delaying the onset of puberty. Chronic silastic implants or daily afternoon (but not morning) melatonin injections cause delay of the onset of puberty, whereas pinealectomy abolishes the ability of CT mice to delay the onset of puberty in short day photoperiod. Conversely, GA juveniles do not delay the onset of puberty following short day or melatonin treatment. These studies suggest that a fundamental difference exists in the regulation of pubertal development between GA and CT *P. leucopus*. Studies using melatonin pellet implants in various brain regions suggest that the basal hypothalamic area is the brain site for melatonin's action causing regression of

reproduction in adults. Similiar studies suggest that the basal hypothalamic area is also the site for melatonin action delaying the onset of puberty in juveniles. We will continue to use these two populations as a model system to study the mechanism for melatonin's action in the delay of the onset of puberty as well as regression in adult *Peromyscus leucopus*.

* * *

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Since the last newsletter the animal facilities in the Biology Dept. were renovated and have recently returned to use. During the renovation the colony stocks had to be reduced to the minimum stock needed to preserve genetic lines as other campus facilities would not house them because they are "wild animals". This then raises an issue that must be resolved in the near future. When does a wild animal in a colony become a domestic stock such that it, and the people who work with it, are not treated like the plague? Animal care committees need to develop guidelines for researchers which cover not only traditional domestic animals but also wild animals that we colonize into the lab and then maintain as stocks over some time period. When or after how many generations do we consider a "wild" line a domestic lab stock? Our local committee considers field-captured animals and all future generations as "wild". Therefore our research is always considered a category C project because it involves cage restraint of a "wild" animal thereby requiring a full university animal committee review and approval. The question for most university animal review committees then becomes one of defining when a rodent stock becomes a laboratory animal. From my own point of view three generations from the wild-caught stock would be a reasonable point to start referring to them as purpose-bred domestic laboratory animals. Having put a definition on wild and laboratory stocks, then the animal committees should screen the standard domestic stocks and the newly derived ones for transmissible diseases of any type of origin to assess risk to either group. Finding nothing of concern the newly established colony should then be treated as any domestic laboratory stock. Why is this issue raised? Specifically so that those of us who work with these "wild" organisms can operate like researchers who buy animals from traditional sources. Termination of research projects and truncation of breed stocks could also be reduced as the "wild" animals would be certifiably domestic and, hence, during facility changes alternative space would be more readily located. Another problem arises when large numbers of animals are needed for a

specific research goal but the investigators animal-housing facility lacks sufficient space. If the animal line is domestic then space elsewhere for domestics could be utilized. As more researchers look to wild-derived model animal systems these problems will become more frequent and must be dealt with within a University structure. Those of us who chose to center our research on natural rather than highly domesticated or derived models need to aide one another in our efforts to inform local animal committees on "wild" animals, there use, and degree of regulation within the research community.

* * *

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We have been investigating the possible role of mitochondrial-nuclear genomic interaction on growth regulation in hybrid *Peromyscus*. Interspecific hybridization of *Peromyscus polionotus* and *P. maniculatus* is accompanied by marked size differences between reciprocal F_1 . These are seen in the fetus and persist throughout life. Since the mitochondrial genome is inherited only through the maternal line and the mtDNA of the two species can readily be distinguished by restriction enzymes (Lansmans et al., 1983), we are testing the hypothesis that increasing species divergence between the mitochondrial and nuclear genomes within animals will exaggerate the reciprocal size effects through misregulation of growth, whereas species-compatible genomes are expected to diminish the effects. Four series of backcrosses have been established from females of the two reciprocal F_1 hybrids, insuring continuity of the maternal mitochondrial composition at each generation. Size and weight measurements are being made on neonatal, ten-day-old and six-month old animals through five backcross generations. Results to date contradict the hypothesis. Deermice with *P. polionotus* mitochondrial DNA, but 95% or more *P. maniculatus* nuclear composition, and animals with *P. maniculatus* mitochondria and principally *P. polionotus* nuclei have regressed in mean size parameters to those of *P. maniculatus* and *P. polionotus* respectively as have mice in the two control backcross series. The basis for hybrid maternal effects on growth and size in this *Peromyscus* cross is more likely attributable to immunological or endocrinological mechanisms than to mitochondrial-nuclear genomic interaction. (Dawson and Sagedy)

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We currently are studying the ecology of the gopher mouse, *Podomys floridanus*, at the Katherine Ordway Preserve in Putnam County. Since 1983 we have been monitoring a population of mice on longleaf pineturkey oak sandhills. In the future we plan to study foraging behavior of mice in this habitat and to examine the effects on population density when supplementary food sources are provided.

* * *

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My research efforts have been directed toward foraging ecology of *Peromyscus melanophrys* (the Plateau Mouse). *P. melanophrys* from scrub desert regions of central Mexico were maintained in the laboratory, and first generation lab-raised offspring were used in a quantitative experiment, devised to evaluate foraging and caching responses. The potential factors affecting differential foraging that were examined included food value (size), traveling time, degree of satiation and sex (males and females). Preliminary results indicate several differences in foraging strategies between *P. melanophrys* and other similarly tested small mammals.

Michael Ferkin (Boston University), John Avangelista (SUNY Brockport), and I are also in the process of reviewing and analyzing several years of laboratory data on maternal care and litter size of *P. melanophrys*.

* * *

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Evolutionary Genetics, Cytogenetics, and Systematics of *Peromyscus*

For our multifaceted research into genetic mechanisms of evolution, *Peromyscus* is an ideal research animal in that it provides a biologically, biomedically, and evolutionarily relevant system for evaluation of the various roles of chromosomal mutations. The large number of *Peromyscus* species and their natural chromosomal lability (variability for pericentric inversions and heterochromatic arms within a constant diploid number of 48) provide the basis for most of our projects.

Over the past few years one of our projects has dealt with forms of the *P. maniculatus* group from the Pacific Northwest. Karyotypic differentiation, analyzed using chromosomal banding techniques, has allowed us to document the specific distinction of *P. oreas* from *P. maniculatus*. Doctoral research by Scott Gunn and Stuart Calhoun and Masters work by Mark W. Allard and Jan Ensink have further shown that these differences are substantiated at the allozymic and morphological levels and that these have diverged far less than has the chromosomal level. Additionally, these studies have resulted in a complete revision of the taxonomy and distribution of *Peromyscus* in the Vancouver Island region. Both *P. maniculatus* and *P. oreas* were determined to inhabit and have specific ranges on these islands.

A second, but similar line of research of the Mexican forms of the *P. boylii* group has involved cooperation of this program with those of David J. Schmidly, C. William Kilpatrick and their graduate students. A complete systematic revision of these forms will appear in several papers already published or in press. We have received new NSF funding to investigate the population genetics of pericentric inversion polymorphisms within selected populations of *P. boylii* [= *beatae*].

Our recent research emphasis has involved cytogenetic investigations of the meiotic mechanisms of chromosomal rearrangements and their effects, heredity, and incorporation in *Peromyscus*. These studies utilize relatively new techniques for light and electron microscopic analyses of whole cell complements of synaptonemal complexes (SC) as linear representatives of chromosomal pairing behavior during prophase I. We supplement this approach with analyses of C-banded diakinetid and metaphase II nuclei. Initial studies by Dave Hale and others in our group have indicated that heterozygous pericentric inversions in *Peromyscus* pair nonhomologously (heterosynapse) and therefore do

not form the classically predicted loop configurations. Additionally, we have found that pericentric inversion heterosynapsis is a) the result of the specific pattern of autosomal synapsis in these animals and b) circumvents crossing over between heterozygous inverted segments. The SC approach has also been valuable in analyses of the meiotic behavior of the sex chromosomes, and in documenting events such as spontaneous meocyte aneuploidy and other types of chromosomal mutations and their effects. Our SC research using various species and crosses of *Peromyscus* continues and has just received renewed NIH funding.

Recent Graduates: Scott J. Gunn (Ph. D.), Marc W. Allard (M. S.), Kathleen P. Fuxa (M. S.), Terry VanFleet (M. S.)

* * *

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I am doing my thesis research on the genetic mechanisms that produce rare alleles in a subspecific hybrid zone of *Peromyscus californicus*. I am maintaining a small breeding colony of *P. californicus*, and I would be happy to provide animals when possible to other investigators for the cost of shipping. Most of the mice were caught in the summer of 1986 at the following locations:

<i>P. c. californicus</i>	San Luis Obispo Co., CA
<i>P. c. insignis</i> Angeles Cos.	Riverside, San Diego, and Los Angeles

* * *

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Co-worker:
Duncan Innes

The focus in our laboratory is on the determination of the roles of endogenous opioid and other neuropeptide systems in the mediation of *Peromyscus maniculatus* behavior. We are also currently investigation the relations between opioid activity and island-mainland population differences in behavior.

Kavaliers, M. & M. Hirst. 1985. Differential opiate influences on food hoarding and intake in the deer mouse, *Peromyscus maniculatus*. *Life Sci.*, 37:221-2220.

Kavaliers, M. & M. Hirst. 1986. Food hoarding and ingestion in the deer mouse, *Peromyscus maniculatus*: Selective responses to mu and kappa opiate agonists. *Pharmacol. Biochem. Behav.*, 25:543-548.

Kavaliers, M. & D. Innes. 1987. Stress-induced, opioid analgesia and activity in deer mice: Sex and genetic differences. *Brain Res.*

* * *

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Darrin Werbitsky
Donald B. Hoagland

The focus in our laboratory is on the systematic relationships and mechanisms of speciation of peromyscine rodents. We are continuing a number of protein electrophoretic studies using serial starch and polyacrylamide gel electrophoresis to examine genetic differentiation among taxa and to identify derived electromorphs to infer phylogenetic relationships. Much of our work has centered on the taxa of the *Peromyscus boylii* species group. Two major emphases in our current work are examining the more divergent taxa which have been recently removed from the genus *Peromyscus*, such as *Megadontomys*, *Osgoodomys*, and *Habromys*, and examining the extent of congruence between genetic and chromosomal differentiation in *Peromyscus*.

Some of the specific projects presently in progress by our group are described by title below:

1) Biochemical systematics of *Habromys*, *Megadontomys*, *Osgoodomys* and other peromyscine rodents (Werbitsky and Kilpatrick).

2) Biochemical systematics of populations of *Peromyscus boylii*. III. Genetic differentiation within and among populations. (Rennert and Kilpatrick).

3) A re-examination of the systematic implications of chromosomal banding data for *Peromyscus* (Kilpatrick, Rennert, Hoagland, and Werbitsky).

4) Biochemical systematics of the *Peromyscus boylii* species group. I. Populations of *Peromyscus aztecus*.

At present we have small breeding colonies of five taxa of *Peromyscus* at UVM:

- P. maniculatus gracilus* from Vermont
- P. maniculatus blandus* from Texas
- P. leucopus noveboracensis* from Vermont
- P. californicus* from southern California
- P. eremicus* from Texas

Recent Publications:

Rennert, P. D. and C. W. Kilpatrick. 1986. Biochemical systematics of populations of *Peromyscus boylii*. I. Populations from east-central Mexico with a low fundamental number. *J. Mamm.*, 67:481-488.

Werbitsky, D. and W. W. Kilpatrick. In press. Genetic variation and genetic differentiation among allopatric populations of *Megadontomys*. *J. Mamm.*

Rennert, P. D. and C. W. Kilpatrick. In press. Biochemical systematics of *Peromyscus boylii*. II. Chromosomally variable populations from eastern and southern Mexico. *J. Mamm.*

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I have an ongoing interest in *Peromyscus* -- specifically in the taxonomic status of *Peromyscus (maniculatus) oreas* -- although I have no work-in-progress on this genus at the moment.

We have an extensive series of Pacific Northwest *Peromyscus maniculatus* specimens in our collections, however. These include, for example, a series collected along the Columbia River circa 1974, represented by the subspecies *artemisiae*, *austerus*, *gambeli*, *oreas* and *rubidus*. Another collection donated by R. H. Taylor in the late 1960's, early 1970's, includes wild caught, captive bred (known age recorded on most), and lab produced hybrids.

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Our long-term studies of the population biology of the white-footed deer mouse, *Peromyscus leucopus* continue at the Allee Memorial Woods field station in west-central Indiana. At present, two main projects are underway:

1) We are interested in the patterns of spatial heterogeneity in demography and genetics in this species. Our work is directed toward understanding the spatial extent of a "population" defined genetically or demographically. Our previous work has shown that the genetic and demographic units do not coincide in our populations. Recent work has focused on the temporal stability of population structure. We find that demographically or genetically homogeneous units are not temporally stable, that is, the patterns of variation change over time in location and scale. Current work is directed at understanding the bases of this variation.

2) We are also interested in understanding the process of dispersal in these populations. Movement of individuals clearly plays an important role in the patterns described above. In addition, we are trying to understand the adaptive significance of movement away from the natal area compared with philopatry. We have measured the patterns of dispersal and the relative success of immigrants and philopatric residents. We are currently beginning an experimental study of the relative importance of avoiding inbreeding, competition for mates and competition for economic resources in the evolution of dispersal.

* * *

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I currently work with laboratory populations of *P. leucopus noveboracensis*, *P. maniculatus blandus*, *P. polionotus leucocephalus*, *P. p. niveiventris*, *P. p. subgriseus*, *P. p. rhoadsi*, and *P. p. phasma* at the Brookfield Zoo. We have facilities for maintaining about 1,500 mice, and are involved in research on inbreeding and outbreeding depression.

* * *

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We have several ongoing projects involving ecology and toxicology of *Peromyscus leucopus*. Brief descriptions of three of these follow.

1. Studies on effects of habitat disturbance have continued intermittently since spring 1983. Findings thus far indicate that where habitats disturbed by clearcutting or stripmining (or perhaps just set back to an earlier successional stage) adjoin undisturbed woodlands, subpopulation segregation occurs along the transition zone. The results of reciprocal removal experiments suggest that this segregation is behaviorally maintained, since removal of mice from the woodland habitat is followed by colonization by individuals formerly known to live in the adjoining disturbed habitat. (Linzey)

2. A long-term study on strategies used by *P. leucopus* in dealing with our unpredictable western Pennsylvania winters is now in its third year. This research focusses on the use of bluebird nest boxes by mice throughout the year, but the data are initially being examined for usage patterns that correlate with environmental conditions, particularly temperature and snow cover. We are currently synthesizing a voluminous data set, dealing at present with determining how much of the observed variations are due to seasonal and yearly fluctuations in population density. In the meantime, the data keep coming in and we keep waiting for two winter seasons that have something in common. (Linzey, Kesner, Waechter, Pistole, Nagy)

3. A third project involves a laboratory study of effects of chronic exposure to low dietary levels of PCBs (10 ppm). A study has been completed that follows mice to the third generation of exposure, monitoring reproductive success, body weight, and development of reproductive organs. In general, the results indicate that effects on breeding success of the first generation depend somewhat on age of first exposure, but that lowered survival rates of second generation young are common to all groups. Reproductive success, body weights, and development of reproductive organs of second generation young are severely affected by PCBs exposure and a third generation is virtually nonexistent. We plan to compare overall developmental rates of second generation young and will shortly be beginning to analyze for residue levels in specimens resulting from the breeding studies. (Linzey, Grant)

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P. leucopus is being used here in comparative experiments with *Microtus pennsylvanicus* and *Onychomys leucogaster* to test relative capabilities of small rodent herbivores, omnivores and insectivores to restrict fecal and urinary sodium loss while under conditions of extremely low sodium intake. Diet experiments in metabolic chambers have provided no support for the hypothesis that *M. pennsylvanicus* has especially well-developed physiological mechanisms for maintaining sodium balance under these conditions. Analyses of variance conducted with fecal and urinary data yielded significant species differences, but show *P. leucopus* to be the better conserver of sodium. This seems to be strongly related to urine volume, and I think that *P. leucopus*' ability to reduce urine volume is the foremost reason for its superior sodium-conserving ability.

My *P. leucopus* came from Gale Haigh's large breeding colony at Michigan State. At present I am maintaining only a few good breeders.

* * *

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Morphologic variation within and among members of the *Peromyscus boylii* and *P. aztecus* species groups, is being examined in light of recent karyotypic and electrophoretic studies by Ira Greenbaum and his co-workers.

Current projects involving *P. boylii* focus on the status of *P. ambiguus* in northeastern Mexico, determining the taxonomic affinities of *P. boylii* in Oaxaca and surrounding states, and an overall examination of variation among populations of *P. boylii* from Mexico and Central America.

Peromyscus aztecus is being examined to determine the taxonomic affinities of the four taxa currently recognized as subspecies. This study also will examine the effects of elevation as it related to body size in this species.

* * *

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For several years, my students and I have been studying the physiological, ecological and behavioral dynamics of *Peromyscus* population growth and regulation. Dr. Eric Bradley, an Endocrinologist here at William and Mary, has measured hormone levels associated with the reproductive inhibition we have observed in laboratory populations of *Peromyscus maniculatus bairdii* and has recently published data suggesting the involvement of the thyroid in curtailment of reproductive maturation and function. This work is being continued.

Much of our laboratory work over the past few years has focused on factors influencing reproductive inhibition, maturation, and recovery from such inhibition. Interesting recent published and unpublished findings indicate that direct physical contact with population animals is a more potent stimulus than olfactory cues for reproductive inhibition in the populations. Further, direct physical contact with animals of the opposite sex is more stimulating than urine in producing rapid recovery from reproductive inhibition. *Peromyscus* appear to be less oriented toward olfactory cues than *Mus*. We are continuing this work.

Another area of work on which I am focusing a good deal of attention and energy is a long-term study of a natural population of the White-footed mouse (*Peromyscus leucopus noveboracensis*) on an 11 hectare grid with 300 trap stations spaced at 20 meters with two traps at each station. Equidistant from each trap station is a wooden nest box attached to a tree at about 1 1/2 meters above the ground (a total of 264 boxes). We are studying the dynamics of this local population to ascertain whether phenomena observed in the laboratory also occur in nature. We have noted, for example, significant inhibition of reproduction and of reproductive organ development associated with increase in population numbers. These studies are now in their fourth year.

One of the questions of interest associated with the natural population study mentioned above and concerning which readers of this newsletter may have some suggestions, is the question of how local populations are organized. I have been interested in understanding the deme concept in *Peromyscus* populations. Are there discernable differences in the dynamics of neighborhoods of extensive local populations? The data presented below illustrate the questions I am wondering about. In June and July of 1975, during the normal breeding season, P. I. n. were sampled from two subunits of a natural population separated by approximately 1/4 of a mile and in similar habitats. Autopsies were performed and the body and reproductive organ weights were compared and found to differ significantly (see table). The mice from the Old

Eastern State area had significantly smaller body weights, testes and seminal vesicles, ovaries and uteri than mice sampled during the same month approximately 1/4 of a mile away in Cemetery Woods. While these data are not definitive for several reasons, they are suggestive of drastic inhibitory influences on reproductive process expressed in one local population and not in another during the same breeding season. I would be interested to hear if readers of the newsletter have encountered a similar phenomenon and what their opinion is regarding it.

Comparisons of body and selected organ weights of field caught white-footed mice (Peromyscus leucopus noveboracensis) from two locations

Organ	a. Old Eastern State		b. Cemetery Woods		P
	N	Mean \pm SE	N	Mean \pm SE	
Males					
Body weights	10	18.01 \pm 1.06	15	20.81 \pm 0.38	<0.05
Testes (paired)	10	239.6 \pm 25.55	16	359.87 \pm 18.71	<0.001
Seminal vesicles (paired)	10	68.05 \pm 9.81	16	107.68 \pm 9.15	<0.01
Females--Total					
Ovaries (paired)	4	1.5 \pm 0.64	7	10.07 \pm 0.74	<0.001
Females--Nonparous					
Body weights	4	15.86 \pm 0.64	7	19.10 \pm 1.01	<0.005
Ovaries (paired)	3	1.00 \pm 0.57	7	10.07 \pm 0.74	<0.001
Uterus	3	7.00 \pm 1.52	7	67.57 \pm 11.13	<0.008
Date Animals Captured	6/20/75-7/2/75		7/18/75-7/25/75		

* * *

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Long Term Population Studies of White-Footed Mice

Since 1973 we have been monitoring a population of *P. leucopus* in a 2.5 ha woodlot in northwest Ohio. Numbers usually peak from July through September and vary from as few as 11/ha (1982) to as many as 83/ha (1980). In 1979 nest boxes were added to help monitor births and to determine maternity of pups. In 1983-4 we studied the effect of concentrated and dispersed supplemental food on home range and reproduction. Presently we are determining the extent of dispersal from the woodlot. Based on captures of this species in surrounding croplands and farmsteads, woodlot populations may be less isolated than we previously thought. A laboratory colony was established in 1985 in order to conduct experiments on mate choice and inbreeding and outbreeding depression among populations from different woodlots.

* * *

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