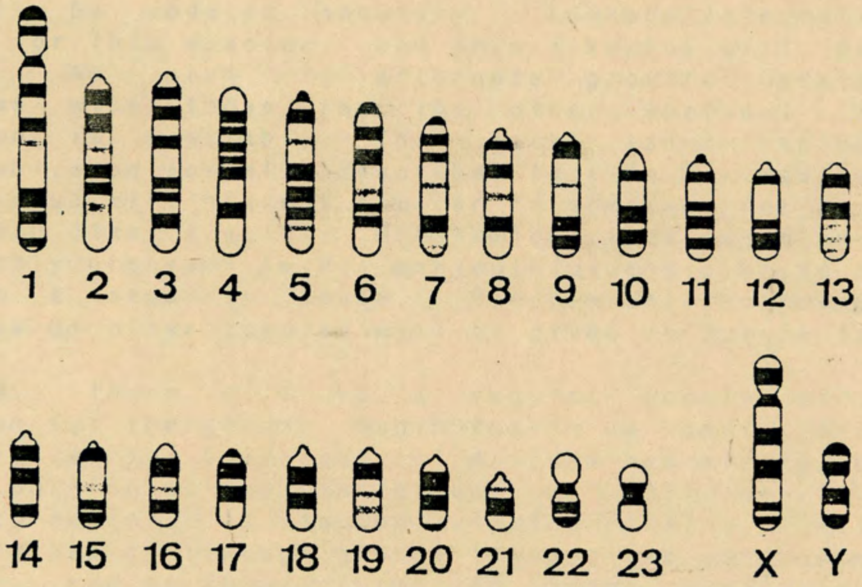
PEROMYSCUS NEWSLETTER

NUMBER ONE



PEROMYSCUS STANDARD KARYOTYPE

MARCH 1986

COVER: The standardized karyotype of Peromyscus. Courtesy of O. Ward. (See: Cytogenet. Cell Genet. 19:38-43, 1977)

WELCOME !

Welcome to the first issue of PEROMYSCUS NEWSLETTER, an informal exchange of information about deer mice, white-footed mice and their allies. **Peromyscus Newsletter** is made possible under a National Science Foundation grant to the University of South Carolina which also supports, in part, a Peromyscus Stock Center at this institution. The Newsletter is not an official publication and should not be cited without permission from the contributor.

Peromyscus Newsletter is designed to fill several functions. First, the location of laboratory breeding stocks and strains will be identified together with the genetic characteristics and history of each stock. Animals from these stocks may or may not be available for distribution.

Second, there will be periodic updates of the current status of genetic information for species of the genus. Numerous genetic loci have been described for **P. maniculatus** and a list of these will be updated annually. Linkage information is also available for this species, and this likewise will be included regularly. We plan to alternate genetic updates for **P. maniculatus** with those for the other species, where less information is available. This first issue includes a table listing published formally described loci in **P. maniculatus** and the next issue will present similar information for **P. leucopus, P. truei** and other species. Biochemical loci based on surveys of natural polymorphisms in **P. maniculatus** and sibling species are listed in a separate table. Biochemical polymorphisms in populations of other species will be given in future issues.

Third, there will be a regular update of karyotypic information for the genus, beginning in an early issue. Dr. Oscar Ward of the University of Arizona has kindly consented to edit this portion of the newsletter, as well as to serve as general co-editor. It is anticipated that it will soon be possible to assign linkage groups to specific chromosomes in the deer mouse, and as this information becomes available it will be included.

Fourth, there will be periodic updates of molecular genetic information for **Peromyscus**, beginning in the next issue. This will include citation of sequence and restriction map data. Cloned DNA libraries are now being generated for **Peromyscus**. These will be listed together with pertinent information, such as source and cloning vector. References to known **Peromyscus** DNA (and amino acid) sequences will be updated annually.

Fifth, periodically the systematics of the genus will be summarized. A table of the currently recognized species as now classified is included in this first issue.

As a matter of human and historical interest in each issue we intend to present a brief biographical sketch of an individual who has made a significant contribution to **Peromyscus** biology. We have labelled this section "Peromyscus Pioneers", and in the current issue we feature Wilfred Osgood.

A major function of the **Newsletter** is to present contributed entries describing in-progress **Peromyscus** research. Entries have been solicited from persons on our provisional mailing list. We undoubtedly overlooked many who could make interesting contributions, and hope to have contributions in the future from any and all individuals who have an interest. Each entry has been edited to a standard format, but otherwise is verbatim as received from the contributor. The entries are arranged alphabetically by the name of the contributor.

Finally, we have included a list of recent publications dealing with **Peromyscus**. The list has been limited to articles published in the past two years. For this issue the years 1983-85 are listed. The list will be updated with each issue. Our list is probably not complete, so any additions should be called to our attention for future issues. Dr. Bruce Buttler of Canadian Union College is compiling a comprehensive bibliography for **Peromyscus** genetics, and this may be consulted for complete citations of references given in the tables of gene lists.

There are sure to be many suggestions for changes and improvements which can be incorporated into future issues. We also will appreciate any corrections or additions to the information we have presented in the tables and elsewhere that we may have overlooked. **PLEASE LET US HAVE YOUR INPUT.**

Contributions for future issues and other communications should be addressed to:

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SYSTEMATICS

ORDER RODENTIA

Suborder Myomorpha

Family Muridae or Cricetidae

Subfamily Sigmodontinae

Tribe Peromyscini

Genus **PEROMYSCUS**

Subgenus **Megadontomys**

P. thomasi - Thomas' Deer Mouse

Subgenus **Isthmomys**

P. flavidus - Yellow Deer Mouse
P. pirrensis - Mount Pirri Deer Mouse

Subgenus **Haplomylomys**

* **P. eremicus (14)** - Cactus Mouse
P. eva (2) - Eva's Desert Mouse
P. merriami (2) - Merriam's Mouse
P. guardia (3) - Angel Island Mouse (I)
P. interparietalis - San Lorenzo Deer Mouse (I)
P. collatus - Turner Is. Canyon Mouse (I)
P. dickeyi - Dickey's Deer Mouse (I)
P. pembertoni - Pemberton's Deer Mouse (I)
* **P. californicus (5)** - California Mouse

Subgenus **Habromys**

P. simulatus - Jico Deer Mouse
P. chinanteco - Chinanteco Deer Mouse
P. lophurus - Crested-tailed Mouse
P. lepturus (2) - Slender-tailed Deer Mouse

Subgenus **Osgoodomys**

P. banderanus (2) - Michoacan Deer Mouse

Subgenus **Podomys**

P. floridanus - Florida Mouse

Subgenus **Peromyscus**

crinitus-species group:

* P. crinitus (8) - Canyon Mouse
P. caniceps - Burt's Deer Mouse (1)
P. pseudocrinitus - False Canyon Mouse (1)

hooperi-species group:

P. hooperi - Hooper's Mouse

boylii-species group:

* P. pectoralis (3) - White-ankled Mouse
* P. boylii (12) - Brush Mouse
P. attwateri - Attwater's Mouse
P. polius - Chihuahuan Mouse
P. stephani - San Esteban Island Mouse (1)
P. evides - Osgood's Deer Mouse
P. aztecus - Aztec Mouse
P. oaxacensis - Oaxacan Deer Mouse
P. winkelmanni - Forest Mouse
P. hyloceter - Southern Wood Mouse

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* P. truei (15) - Pinyon Mouse
* P. difficilis (8) - Rock Mouse
P. bullatus - Perote Mouse

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* P. melanophrys (6) - Plateau Mouse

mexicanus-species group:

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P. yucatanicus (2) - Yucatan Deer Mouse
* P. mexicanus (6) - Mexican Deer Mouse
P. gymnotis - Naked-eared Deer Mouse
P. mayensis - Mayan Deer Mouse
P. stirtoni - Stirton's Deer Mouse
P. nudipes (3) - Naked-footed Deer Mouse

mexicanus-species group (continued):

P. furvus - Blackish Deer Mouse
P. altilaneus - Todos Santos Deer Mouse
P. guatemalensis (2) - Guatemalan Deer Mouse
P. megalops (4) - Brown Deer Mouse
P. melanocarpus - Zenpoaltepec Deer Mouse
P. zarhynchus - Chiapan Deer Mouse
P. grandis - Big Deer Mouse

leucopus-species group:

* **P. leucopus** (17) - White-footed or Wood Mouse
* **P. gossypinus** (7) - Cotton Mouse

maniculatus-species group:

* **P. maniculatus** (64) - Deer Mouse
P. oreas (2) - Vancouver Deer Mouse
P. sejugis - Santa Cruz Island Mouse (I)
P. slevini - Slevin's Mouse (I)
P. sitkensis (2) - Sitka Deer Mouse (I)
P. melanotis - Black-eared Mouse
* **P. polionotus** (17) - Oldfield or Beach Mouse

EXTINCT SPECIES:

Subgenus **Haplomylomys**

Pliocene: **P. dentalis, P. pliocenicus, P. antiquus**
Early Pleistocene: **P. kansasensis, P. baumgartneri, P. hagermanensis**
Mid-Pleistocene: **P. irvingtonensis, P. cragini**

Subgenus uncertain or transitional

Mid-Pleistocene: **P. progressus, P. berendsensis, P. cumberlandensis**
Late Pleistocene: **P. nesodytes, P. anyapahensis, P. imperfectus**

Subgenus **Peromyscus**

Late Pleistocene: **P. cochrani, P. oklahomensis**

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* Major species, i.e. widely distributed and polytypic. Number of subspecies given in () after specific epithet. I in () after common name indicates exclusively insular species.

GENETIC LOCI IN THE DEER MOUSE

(**Peromyscus maniculatus**)

Tables Ia through Id 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.

Table II lists presumptive biochemical loci described as 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 ignored. Again, only those reports in article form 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 different designator for the other.

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.

Table IA

Peromyscus maniculatus species group

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	A^{Nb}	dominant		McIntosh (1956a)	Blair (1947) as "buff"	Clark (1938) as "buff"; Barto (1956)
White belly non agouti	a^w	recessive		Egoscue (1971)		
Extreme non-agouti (Black)	*a*	recessive		Horner et al. (1980)		
BROWN	*b*	recessive	II	Huestis and Barto (1934)	Blair (1947); McIntosh (1956a); Dawson et al. (1969)	Huestis and Barto (1934) Blair (1947); Barto 1955, 1956); McIntosh (1956a)
Orange-tan	b^{ot}	recessive		Egoscue and Day (1958);		
BLOND	*bl*	recessive		Pratt and Robbins (1982)		
ALBINO	*c*	recessive	I	Sumner (1922)		Sumner (1922); Clark (1936, 1938); Feldman (1937); Barto (1942a); Huestis and Lindstedt (1946); Huestis (1946)
COLORLESS HAIRTIP	*ctp*	recessive		Bowen and Dawson (1969)	Bowen (1968)	
DILUTE*	*d*	recessive	II	Dice (1933)		Clark (1938); Barto (1942a, 1956); McIntosh (1956a)
GRAY	*g*	recessive		Dice (1933)	Clark (1938); Blair (1947); McIntosh (1956a)	Blair (1944, 1947)
IVORY	*i*	recessive		Huestis (1938)	Clark (1938)	Barto (1942a; 1956); McIntosh (1956a)
PINK-EYE DILUTION	*p*	recessive	I	Sumner (1917)	Barto (1942b)	Sumner (1922); Clark (1936, 1938); Feldman (1937); Snyder (1980a)
PLATINUM	*pt*	recessive		Dodson et al. (1986)		
RED EYE (Heterochromia)	*r*	recessive		Huestis and Willoughby (1950)		
DOMINANT SPOT (Whiteface)	*S*	dominant		Feldman (1936)	Maddock (1966)	Feldman (1937)
SILVER	*si*	recessive	I	Huestis and Barto (1934)		Huestis and Barto (1934); Huestis and Piestrak (1942); Huestis and Lindsted (1946); Barto (1956)
WHITE CHEEK	*Wc*	dominant		Blair (1944)	Bowen and Dawson (1977)	Blair (1944)
WHITESIDE*	*wh*	recessive		McIntosh (1956b)		
YELLOW	*y*	recessive		Sumner (1917)	Sumner and Collins (1922); McIntosh (1956a)	Summer (1922); Feldman (1937); (1956a); Barto (1956)
COMPLEXLY INHERITED TRAITS:						
Minor white spotting (star, splash, etc.)	*p-1; p-2*	recessive incompletely penetrant		Feldman (1936)	Summer (1932); Barto and Huestis (1933)	
Grizzled*	*"G"*	"complex dominant"		Sumner (1932)		
Coat pattern in P. polionotus				Bowen and Dawson (1977)	Bowen (1968)	Bowen and Dawson (1977)
Pointed A	*Pa*	dominant	VII			
Pointed B	*Pb*	dominant	VII			
Tapered	*Tp*	dominant				
Coat pattern modifiers in P. polionotus				Bowen and Dawson (1977)		
Squared modifier	*Rs*	incompletely dominant				
Tapered modifier	*Rt*	dominant				

*No longer known to be in existence

Table IB

Peromyscus maniculatus species group

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)	*cw*	recessive		Anderson and Burns (1979)		
FLEXED-TAIL	*f*	recessive	I	Huestis and Barto (1936a)		Huestis and Barto (1936a); Huestis and Piestrak (1942); Huestis and Lindstedt (1946); Huestis (1946); Huestis, et al (1956); Barto (1956)
HAIRLESS-1	*hr-1*	recessive		Sumner (1924)		Sumner (1924, 1932); Feldman (1937); Clark (1938); Barto (1942a, 1955, 1956); McIntosh (1956a)
HAIRLESS-2	*hr-2*	recessive		Egoscue (1962)		
NUDE* (post-juvenile)	*n*	recessive		Clark (1938)	Barto (1942a)	
SPHEROCYTOSIS (Hereditary jaundice)	*sph*	recessive		Huestis and Anderson (1954)	Huestis, et al (1956); Motulsky, et al (1956)	Huestis, et al (1956)

*No longer known to be in existence.

Table IC
Behavioral and Neurological Variants

Peromyscus maniculatus species group

Name of locus and alleles	Symbol	Mode of inheritance	Linkage group	Original description and analysis	Collateral descriptions, interactions, and recurrences	Recombination reported
BOGGLER	*bg*	recessive		Barto (1955)	Vandermerer and Barto	Barto (1955)
EPILEPSY (EP)	*e* (*ep*, v_2)	recessive		Dice (1935)	Clark (1938); Watson (1939); Chance & Yaxley (1950); Barto (1954, 1956)	Watson (1939); Barto (1956)
JUVENILE ATAXIA	*ja*	recessive		Van Ooteghem (1983)		
SPINNER*	*sp* (v_3)	recessive		Watson (1939)	Barto (1954)	
TREMOR*	*t*	recessive		Huestis and Barto (1936b)		
WALTZER* (waltzing in bairdii)	*v* (*w*)	recessive	III	Dice (1935)	Clark (1938); Watson (1939); Barto (1942a, 1954, 1956); McIntosh (1956)	

*no longer known to be in existence

Table ID

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^f Adh^s Adh^o	VI	Felder (1975); Burnett and Felder (1978a;1978b)	Dawson *et al*. (1983)
ALBUMIN (serum)	Alb^{100} Alb^{96} Alb^{86}	VI	Brown and Welser (1968); Jensen and Rasmussen (1971)	Dawson (1982); Dawson *et al*. (1983)
AMYLASE (salivary)	Amy^a Amy^b Amy^c	VI	Evans *et al*. (1977)	Dawson *et al*. (1983)
ESTERASE (erythrocytic)	$Es\text{-}1^o$ $Es\text{-}1^a$ $Es\text{-}1^b$	IV	Randerson (1965); Van Deusen and Kaufmann (1978)	
ESTERASES (tissue and serum)	*Es*-2 through *Es*-7 (Symbols not standardized)		Rasmussen and Jensen (1971); Dawson (1982); Gill (1976); Baccus *et al*. (1980)	Dawson (1982)
GLUTAMATE OXALOACETATE TRANSAMINASE (soluble)	$Got\text{-}1^a$ $Got\text{-}1^b$ $Got\text{-}1^c$		Gill (1976)	Dawson *et al*. (1983)
AUTOSOMAL GLUCOSE-6-PHOSPHATE DEHYDROGENASE (soluble)	$G6pd\text{-}1^a$ $G6pd\text{-}1^b$		Shaw and Barto (1965); Shaw (1966)	
α-GLYCEROPHOSPHATE DEHYDROGENASE (tissue)	Gpd^a Gpd^b		Gill (1976)	
HEMOGLOBIN - ALPHA TYPE GLOBINS (Duplicated locus)	$Hba^1 = (Hb^r) = (Hb\ I^a)$ Hba^2 $Hbc^0 = (Hb^0) = (Hb\ I^0)$ Hbc^1 $Hbc^2 = (Hb^f)$		Thompson *et al*. (1966) Rasmussen *et al*. (1968) Jensen *et al*. (1976) Maybank and Dawson (1976) Snyder (1978; 1980b)	
HEMOGLOBIN - BETA TYPE GLOBINS (Duplicated or triplicated locus)	Hbb^1 Hbd^0 Hbd^1 Hbe^0 Hbe^1	I	Snyder (1978; 1980b)	Snyder (1980a)
HAPTOGLOBIN (serum)	Hpt^1 Hpt^2		Rasmussen (1968); Griswold and Dawson (1971)	
IMMUNOGLOBIN ($7S\gamma_1$)	Ig^f Ig^s		Coe (1972)	
LACTATE DEHYDROGENASE A SUBUNIT (tissue)	$Ldh\text{-}A^a$ $Ldh\text{-}A^b$		Cattanach and Perz (1969)	
LACTATE DEHYDROGENASE B SUBUNIT (tissue)	$Ldh\text{-}B^f$ $Ldh\text{-}B^s$		Shaw and Barto (1963)	
LEUCINE AMINO PEPTIDASE (serum)	$Lap\text{-}1^a$ $Lap\text{-}1^b$	V	Dawson (1982)	Dawson (1982); Dawson *et al*. (1983)
SUPEROXIDE DISMUTASE	Ng^J Ng^P Ng^M		Birdsall *et al*. (1970)	
6-PHOSPHOGLUCONATE DEHYDROGENASE (tissue)	$6\text{-}Pgd^a$ $6\text{-}Pgd^a$		Gill (1976)	Dawson *et al*. (1983)
PHOSPHOGLUCOMUTASE-1 (tissue)	$Pgm\text{-}1^a$ $Pgm\text{-}1^b$		Gill (1976)	
PHOSPHOGLUCOMUTASE - 4 (tissue)	$Pgm\text{-}4^a$ $Pgm\text{-}4^b$ $Pgm\text{-}4^c$		Gill (1976)	
ERYTHROCYTIC ANTIGEN	Pm^A Pm^B Pm^C	IV	Rasmussen (1961) Savage and Cameron (1971)	Randerson (1973)
TRANSFERRIN (serum)	$Trf^a = (Trf^J)$ Trf^b Trf^c Trf^e Trf^M	V	Rasmussen and Koehn (1966) Biggers and Dawson (1971) Griswold and Dawson (1971) Canham *et al*. (1970)	Dawson (1982); Dawson *et al*. (1983)

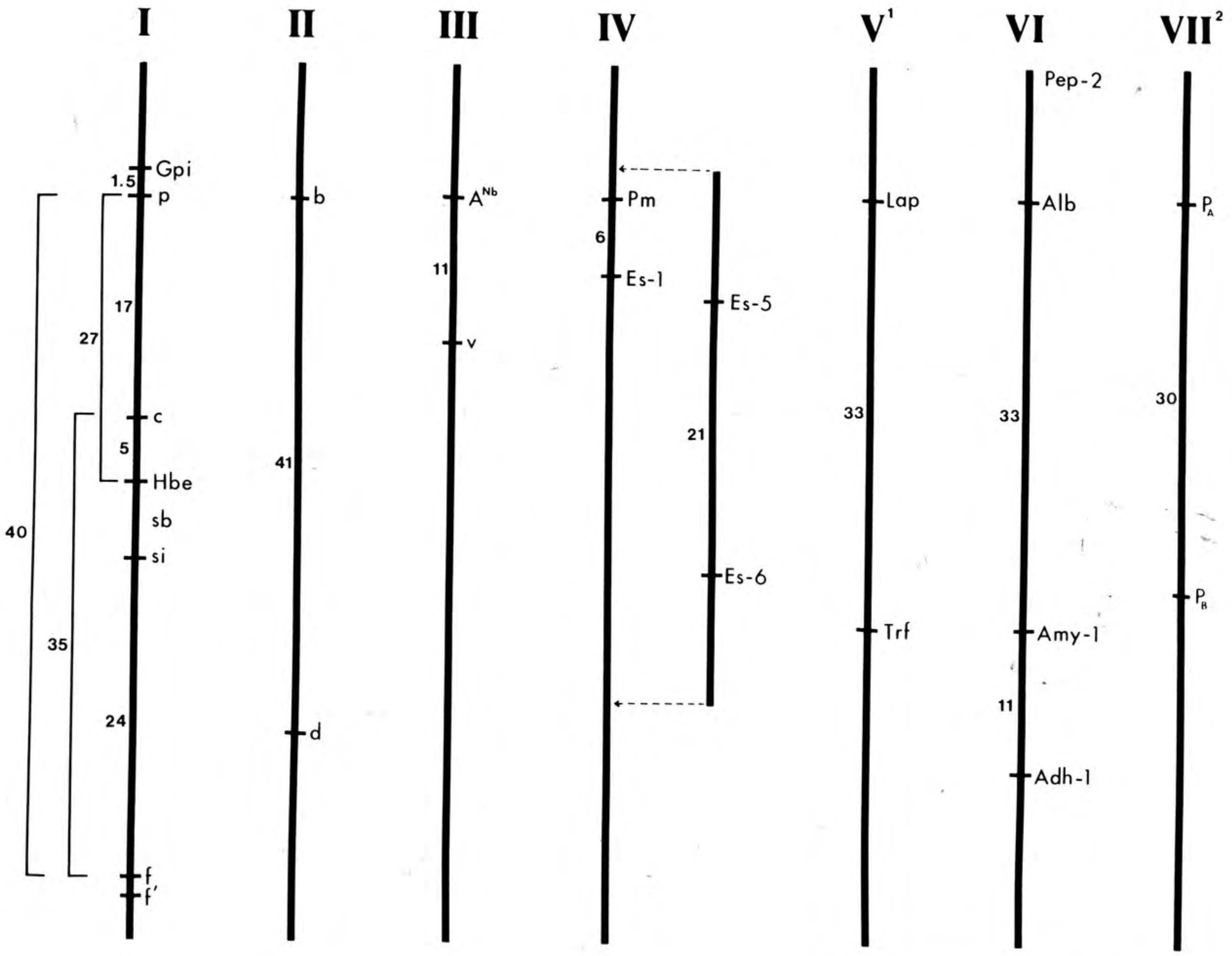
Table II

BIOCHEMICAL GENETIC POLYMORPHIC LOCI REPORTED IN NATURAL POPULATIONS OF PEROMYSCUS MANICULATUS AND OTHER MEMBERS OF THE MANICULATUS-SPECIES GROUP.

Protein	Locus Symbol	Species	References
ALBUMIN	Alb	P. maniculatus P. polionotus	Rasmussen (1970) Jensen and Rasmussen (1971) Selander et al. (1971) Biggers and Dawson (1971) Baccus et al. (1980)
ALCOHOL DEHYDROGENASE	Adh-1	P. maniculatus P. melanotis	Avise et al. (1979) Baccus et al. (1980)
AMYLASE	Amy-1	P. maniculatus	Aquadro and Patton (1980)
ESTERASE	Es-1 Es-2 Es-3 Es-4 Es-5 Es-6 Es-7	P. maniculatus P. polionotus	Rasmussen and Jensen (1971) Selander et al. (1971) Peck and Biggers (1975) Gill (1976) Foltz (1981)
GLUTAMATE OXALOACETATE TRANSAMINASE	Got-1	P. maniculatus P. polionotus P. melanotis	Selander et al. (1971) Gill (1976) Avise et al. (1979) Baccus et al. (1980)
GLUCOSE 6-PHOSPHATE DEHYDROGENASE	G6pd-1	P. maniculatus	Shaw and Barto (1965)
α-GLYCEROPHOSPHATE DEHYDROGENASE	Gpd-1	P. maniculatus P. polionotus P. oreas	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979)
HAPTOGLOBIN	Hpt	P. polionotus	Peck and Biggers (1975)
HEMOGLOBIN	Hba Hbb	P. maniculatus P. polionotus P. melanotis	Thompson et al. (1966) Ahl (1968) Foreman (1968) Rasmussen et al. (1968) Rasmussen (1970) Selander et al. (1971) Snyder (1977, 1980) Avise et al. (1979) Chappell and Snyder (1984)
ISOCITRIC DEHYDROGENASE	Idh	P. maniculatus P. oreas	Mascarello and Shaw (1973) Baccus et al. (1980)
LACTIC DEHYDROGENASE	Ldh-1 Ldh-2	P. maniculatus P. polionotus P. melanotis	Selander et al. (1971) Avise et al. (1979)
MALIC DEHYDROGENASE	Mdh-1 Mdh-2	P. polionotus	Selander et al. (1971)
PEPTIDASE	Pep-1 (Pep-B)	P. maniculatus P. melanotis	Avise et al. (1979) Baccus et al. (1980)
PHOSPHOGLUCOMUTASE	Pgm-1 Pgm-2 Pgm-3 Pgm-4	P. maniculatus P. polionotus P. melanotis	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979)
6-PHOSPHOGLUCONATE DEHYDROGENASE	Pgd-1	P. maniculatus P. polionotus P. oreas	Selander et al. (1971) Mascarello and Shaw (1973) Gill (1976) Avise et al. (1979) Baccus et al. (1980) Foltz (1981)
PHOSPHOGLUCOSE ISOMERASE	Pgi-1	P. polionotus P. melanotis	Selander et al. (1971) Avise et al. (1979) Foltz (1981)
SORBITOL DEHYDROGENASE	Sdh	P. maniculatus	Baccus et al. (1980)
TRANSFERRIN	Trf	P. maniculatus P. polionotus	Rasmussen (1970) Biggers and Dawson (1971) Selander et al. (1971) Gill (1976) Redfield (1976) Avise et al. (1979) Baccus et al. (1980) Foltz (1981)
Miscellaneous Non-specific Proteins		P. maniculatus	Mascarello and Shaw (1973) Gill (1976)

Reference list is available from Dr. Bruce Butler, Div. Natural & Physical Sciences, Canadian Union College, 400 College Heights, Alberta TOC OZO.

Linkage Map of P. maniculatus Species Group



[1] Tentative

[2] In P polionotus

GENETIC LINKAGE MAP OF **PEROMYSCUS MANICULATUS**

Linkage data for the deermouse (**Peromyscus maniculatus**) collected before 1972 are summarized by Robinson (11, 12). Several additional linkages have been added in the interim (2, 5, 6, 13). The accompanying figure 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 (5), 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 (12), and has been partially confirmed by Dodson (unpub.). Linkage of **Trf** and **Lap** is tentative (5), but is homologous with a similar linkage in **Mus**. The **Pep-2** locus is tentatively assigned to Group VI proximal to **Alb**, but has not been mapped further (6).

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

The **Hbe** locus probably represents a dupicated or triplicated beta globin site, according to Snyder (13). 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. Silliman (unpub.) proposed that there is a duplication, **f'**, closely linked to the **f** locus.

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.

----READERS AWARE OF ADDITIONAL LINKAGE DATA SHOULD SUBMIT INFORMATION TO US SO THAT THE MAP CAN BE UPDATED AND REMAIN CURRENT----

Mapped Loci in *Peromyscus*

Gene Symbol	Name of Locus	Linkage Group	Reference
A^{Nb}	Wide-band agouti	III	9
Adh-1	Alcohol dehydrogenase (liver)	VI	6
Alb	Albumin (serum)	VI	6
Amy-1	Amylase (salivary)	VI	6
b	Brown	II	9
c	Albino	I	3, 4, 8, 14
d	Dilute	II	9
Es-1	Esterase-1 (erythrocytic)	IV	10
Es-5	Esterase-5 (kidney)	IVa	5
Es-6	Esterase-6 (kidney)	IVa	5
f	Flexed tail	I	7, 8
Gpi-1	Glucose phosphate isomerase (erythrocytic)	I	13
Hbe	Hemoglobin "e" chain	I	13
Lap	Leucine aminopeptidase (serum)	V	5
p	Pink-eyed dilution	I	3, 4, 14
P_A	Pointed rump pattern A	VII	2
P_B	Pointed rump pattern B	VII	2
Pep-2	Tripeptidase (erythrocytic)	VI ?	6
Pm	Erythrocytic antigen	IV	10
sb	Snub nose	I	12
si	Silver	I	7, 8
Trf	Transferrin (serum)	V	5
v	Waltzing	III	9

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PEROMYSCUS 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. 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.

Peromyscus types currently available in the Stock Center:

WILD TYPES	ORIGIN
P. maniculatus bairdii (BW Stock)	Closed colony bred in captivity since 1948. Descended from 40 ancestors wild-caught near Ann Arbor MI
P. maniculatus (SM Stock)	Closed colony since 1978. Derived from ancestors wild-caught in southern California Combined <u>sonoriensis</u> and <u>gambelii</u> ancestry.
P. maniculatus rufinus (CO Stock)	New stock under development. In captivity since 1983. Origin central Colorado.
P. polionotus subgriseus (PO Stock)	Closed colony since 1952. Derived from 21 ancestors wild-caught in Ocala Nat'l. Forest FL. High inbreeding coefficient.
P. leucopus (LL Stock)	Derived from 38 wild ancestors captured between 1982 and 85 near Linville NC. Early generations.
P. maniculatus X P. polionotus F_1 Hybrids	Sometimes available.

COAT COLOR MUTANTS	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.
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)

OTHER MUTANTS AND VARIANTS	ORIGIN
Alcohol dehydrogenase negative **Adh^{o}/Adh^{o}**	South Carolina BW stock. (Felder, 1975)
Alcohol dehydrogenase positive **Adh^{f}/Adh^{f}**	South Carolina BW stock (Felder, 1975)
Flexed-tail **f/f**	Probably derived from Huestis flexed-tail (Huestis and Barto, 1936)
Hairless-1 **hrl/hrl**	Sumner's hairless (Sumner, 1924)
Hairless-2 **hre/hre**	Egoscue's hairless (Egoscue, 1962)

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

Small numbers of other stocks, mutants and variants are on hand, or under development, but are not currently available for distribution. For additional information of 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)
John A. King (Michigan State University)
Clement L. Markert (North Carolina State Univ.)
Suellen VanOoteghem (Wright State University)
Wallace D. Dawson (University of South Carolina)

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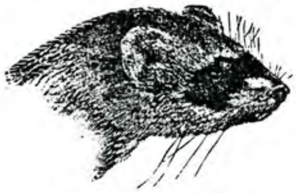

REVISION OF THE MICE OF THE AMERICAN GENUS PEROMYSCUS

BY

WILFRED H. OSGOOD
ASSISTANT, BIOLOGICAL SURVEY

Prepared under the direction of
C. HART MERRIAM
CHIEF OF BIOLOGICAL SURVEY

WASHINGTON
GOVERNMENT PRINTING OFFICE
1909

Wilfred H. Osgood

1875 - 1947

The modern history of Peromyscus biology is frequently dated to the 1909 publication of Wilfred Osgood's classic "**Revision of the Mice of the American Genus Peromyscus**" (North American Fauna No. 28). Prior to this time the taxonomy of the myriad forms of peromyscine rodents was in disarray, but Osgood's insight after examination of more than 27,000 specimens permitted him to establish a classification which remains largely intact until the present. Subsequent taxonomic treatments have mostly involved modest modifications to Osgood's basic scheme. Of his original **Peromyscus**, only a few forms (**Baiomys**, **Ochrotomys**) have been removed from the genus in the most recent classification (Hall, 1981). Thus Osgood's monumental revision paved the way for the subsequent evolutionary and genetic studies of Francis B. Sumner, Lee R. Dice and many others. It is also noteworthy that the **Peromyscus** revision established a trend in mammalian systematics of reducing numerous species to the subspecific level and consolidating these into fewer species more realistically representing their biological status. Subsequent hybridization experiments demonstrated that, in most instances, Osgood's assessment was correct. In this he represented a "new breed" of taxonomist who departed from the contemporary typological paradigm.

Wilfred Osgood was born December 8, 1875, in Rochester, N.H., the oldest of five children. At age twelve he moved with his family to the vicinity of Santa Clara, California, where he attended public schools. He entered the first class of Stanford University, where he came under the influence of its president, zoologist David Starr Jordan. With the support of Jordan in 1897 he secured a position with the Biological Survey in Washington, D.C. prior to completing his undergraduate degree, which he obtained two years later in absentia. Osgood's first **Peromyscus** paper, "A New White-footed Mouse from California" appeared in 1901 (Proc. Biol. Soc. Wash., 14:193-194). In 1904 he described the subgenus **Haplomylomys** and 30 additional forms of **Peromyscus** from Mexico and Central America (Proc. Biol. Soc. Wash., 17;53-54;55-57). He published a paper in the first issue of Journal of Mammalogy (1:33-36), and by his death had 205 publications to his credit. However, after the 1909 revision few of his papers treated **Peromyscus**.

Osgood remained at the Biological Survey until 1909, working as an assistant to C. Hart Merriam, with whom he eventually developed philosophical differences regarding approaches to systematics. In that year he moved to the Field Museum in Chicago, where he remained until his death. He was Chief Curator of Zoology at the Museum for many years. Osgood, known to his colleagues as "Oz", received his doctoral degree at age 43 from the University of Chicago. He became the first Vice President of the American Society of Mammalogists in 1919, and served as President of that society from 1924 until 1926. He was also a member of numerous other scientific and conservation organizations. During his career he collectied extensively in Alaska, Canada, Mexico, and South America. He also visited Africa and Indo-China. His efforts in later years departed from rodents and centered on more exotic species, but he is best remembered for his **Peromyscus** revision which served as the pattern for others to follow. Wilfred Osgood died June 20, 1947, in Chicago, after a brief illness. He was unmarried.

W.H.Osgood.

PEROMYSCUS NETWORK NEWS AND COMMENT.

INBRED PEROMYSCUS. Dr. Muriel Davisson and colleagues at the Jackson Laboratory at Bar Harbor are inbreeding **P. maniculatus**. There are several sublines, some of which are now at the 14th generation of sib mating. The ancestral animals were **P. m. bairdii** from Michigan. - - - Dr. George Smith at UCLA Dept. of Pathology, is attempting to develop an inbred line of **P. leucopus**.

* * *

Peromyscus leucopus cytotypes: Dr. Robert Baker and his group at Texas Tech are continuing their studies of the hybrid zone in Oklahoma between two distinctive karyotypic races of white-footed mice. Mitochondrial DNA analysis is included in the study.

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ON THE MOLECULAR FRONT -- Burton et al. (J. Mol. Biol. 187:291 - 1986) have demonstrated that the **L1** repeat DNA family occurs in **P. maniculatus**. EcoR1 digests of whole genomic DNA give a highly repeated 1.8 kb fragment equivalent to a portion of the L1 of **Mus**. - Wichman et al. (Nature 77:317-318 - 1985) recently reported another transposable-like family, **mys** elements, in **P. leucopus** which they sequenced. This family appears to be limited to New World cricetids, and according to Steven Potter is not homologous with human **Kpn**, which is about 60% homologous to mouse **L1**. -- Rodney Honeycutt at Harvard Museum is conducting a comparative study of highly repetitive (satellite) DNA among **Peromyscus**.

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Pineal-Photoperiod Studies. J. M. Whitsett at N.C. State, L. J. Petterborg at U. Texas - San Antonio, Robert Lynch at Wesleyen U. and others are actively researching relationships between pineal gland and photoperiodic activity in **P. maniculatus** and **P. leucopus**.

* * *

LEE SNYDER. We were saddened by the death last year of Dr. Lee R.G. Snyder, University of California - Riverside. Lee will be long remembered for his analysis of **Peromyscus** hemoglobin loci, and for one of the few concrete examples of natural selection on a single locus variant. His studies convincingly showed that higher elevation populations of deer mice have one hemoglobin haplotype ($a^{0}c^{0}$) in high frequency, whereas lower elevation populations generally have another ($a^{1}c^{1}$) haplotype fixed. The oxygen affinity of these types is appropriate to the native environment. Mark Chappell is continuing some aspects of Lee's work. Lee Snyder will be missed among the ranks of population geneticists and **Peromyscus** workers.

We also learned of the recent death of **W. Frank Blair** at Austin, Texas. Dr. Blair will be the subject of a Peromyscus Pioneer biographical sketch in a future issue of the Newsletter.

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Dr. Richard Padgett, while at U. North Carolina working with Marshall Edgell's group, sequenced all three adult globin genes for **P. maniculatus**. This information should be published soon. Dan Loeb is also involved in this work.

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In addition to the stocks listed in the contributions section of this Newsletter, we are also aware of **Peromyscus** stocks being held by Bob Lynch at Wesleyen University, Don Dewsbury at Univ. Florida, Sue VanOoteghem at Wright State, John Christian at SUNY-Binghampton, Dick Terman at William and Mary and Frank Bronson at U. Texas. Dr. Bernard Pirofsky, Univ. Oregon Health Science Ctr. at Portland and Steve Marx at Boston Childrens Hospital have small numbers of the <u>spherocytosis</u> (**sph/sph**) mutant in **P. maniculatus**.

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Judith Paull has a colony of **P. maniculatus bairdii**, which she expects to disband soon. This colony arises from animals wild-caught in Wisconsin and others from Dick Terman's colony. Her stock has been closed for several years and is free from Sendai and other rodent viral pathogens. Dr. Paull's work has involved toxicology, in collaboration with Dr. Tom Yuill, and reproductive physiology. She has been attempting to define conditions which would permit nuclear transfer between **Peromyscus** and **Mus** embryos. Anyone interested in obtaining animals from this stock should contact Dr. Paull, Department of Animal Science, University of Wisconsin, Madison WI 53707 phone: (608) 263-4308.

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The extensive colony of Dr. John King and his associates at Michigan State University is also in the process of being scaled down and, perhaps, disbanded. This colony has served as a valuable source of **Peromyscus** for many years.

DEADLINE FOR CONTRIBUTIONS TO THE SECOND ISSUE OF

<u>PEROMYSCUS</u> <u>NEWSLETTER</u> IS 1 JULY 1986.

CONTRIBUTIONS

Ann Eileen Miller BAKER
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Fort Collins, CO 80523

I work primarily in the field with **Mus** but indirectly have started working with deermice because they go in the traps I set for **Mus**.

1. When corncribs are emptied, **Mus domesticus** were marked as they left the cribs. Traps were set in the surrounding cornfields and ditches to retrap these crib mice. Deermice predominated in the fields, whereas **M. d.** and **Microtus pennsylvanicus** predominated in grassy areas, such as ditches.

This study was done in Windsor, Ontario with Mike Petras and has been submitted for publication without inclusion of deermice data. It would be mice to let the deermice data be seen by others that might be able to use it- it is too small to publish alone; I would add a note to this effect at the bottom so that people could cite it if they wish.

2. To determine what age-sex-season mice are entering houses, I have started a study where I furnish data sheets and protocols and then cooperators furnish snap-traps. So far, my dentist (!) has set traps with peanut butter in his closet for the prescribed period (number of days when mice enter traps + 14 additional days) and collected 2 female deermice (but I want **Mus**!)- one with placental scars, one with unmarked uterus (no wonder there were no babies!). I gave data sheets to others and so the data should accumulate slowly.

* * *

Mark A. CHAPPELL
University of California-Riverside
Department of Biology
Riverside CA 92521

Co-worker:
Jack P. Hayes

Current Research: Our research concerns the evolution of hemoglobin polymorphisms in **Peromyscus maniculatus** in relation to adaptation to high altitudes. This work is a continuation and extention of Lee Snyder's longterm studies of hemoglobin population genetics and blood gas physiology in **Peromyscus**. Our most recent work involved measurements of whole-animal physiological performance (maximum rates of oxygen consumption during exercise and thermogenesis) at low and high altitudes (340 and 3,800 meters). The effects of hemoglobin genotype were determined using genetic lines of mice which carried particular haplotypes in IBD condition. Most of our experiments were directed at common alpha-globin polymorphisms. However, we also have data on several beta-globin lines and on rare alpha-globin "recombinants".

Thus far, results support Snyder's hypothesis that the major alpha-globin polymorphisms have evolved in response to selection for optimal aerobic capacity at different native altitudes. Mice homozygous for alpha-globin haplotypes common (or fixed) in low-altitude populations perform better at low altitude than do animals from the same IBD line that are homozygous for haplotypes common at high altitudes. When the animals are acclimated to high altitude and retested, the ranking is reversed: mice with "high-altitude" alpha-globins perform better than their compatriots with "low-altitude" alpha-globins. In the single "recombinant" line we have tested, mice carrying "recombinant" alpha-globins are poorer performers than "normal" mice at both high and low altitude.

We are currently examining ecological and behavioral parameters in the field (eastern California) that are relevant to altitudinal adaptation. Field energy budgets are being determined using doubly-labeled water (DLW) during mark-release-recapture experiments. Microclimate studies are also underway. These measurements may elucidate the requirements for thermoregulatory heat production, and hence oxygen demand, at different altitudes and at different times of year.

Stocks: We are presently maintaining 10-15 laboratory lines of deer mice which carry a variety of different hemoglobins. Most of these lines were obtained from small numbers of wild-caught mice, using IBD breeding schemes. We have a number of strains carrying variations of the common alpha-globin polymorphisms. Small numbers of alpha-globin "recombinants" are available. Several lines of beta-globin variants are also maintained.

* * *

Wallace D. DAWSON
Department of Biology
University of South Carolina
Columbia, SC 29208

Co-workers/Associates:
David Covington
Michael Felder
David Kass
Fred Marsteller

Genetic Linkage analysis continues as a major focus of interest. We are particularly concerned with conservation of linkage within the myomorphic rodents and comparisons of the **Peromyscus** linkage map with that of **Mus**. **Rattus**, and **Mesocricetus**. About 37% of the map of the deer mouse is homologous with that of **Mus**. When biochemical loci only are considered, there is 73% homology between the two. Evidence based on the rate at which chromosomal rearrangements occur and the time since most recent common ancestry was shared by **Peromyscus** and **Mus** indicates that linkage conservation is not fortuitous, but conserved by natural selection.

The **Peromyscus L1** EcoR1 1.8kb fragment occurs in **P. maniculatus** and **P. leucopus**. Preliminary runs indicate that the equivalent fragment in **P. polionotus** is slightly smaller. If so, a concerted change in this multigene family has occured.

* * *

Harold J. EGOSCUE
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Studies designed to determine the ecology of **Peromyscus** fleas in the Great Basin of Oregon, Nevada and Utah are being conducted. Seasonal occurrence, altitudinal limits, ecological parameters and geographical distribution of the fleas of **P. maniculatus**, **P. crinitus** and **P. truei** are the main objectives. Of special interest is establishing the extent to which primary **Peromyscus** fleas are shared when two or more species of **Peromyscus** are sympatric.

* * *

Mary Fleming FINLAY
Benedict College
Harden and Blanding Streets
Columbia SC 29208

We maintain **P. maniculatus** (BW stock) and **P. polionotus** (PO) both derived from the University of South Carolina colony.

* * *

B. Elizabeth HORNER
Department of Biological Sciences
Smith College
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Co-worker:
Myra M. Sampson

The black coat-color mutation in **Peromyscus maniculatus gracilis** described in **The Journal of Heredity** (1980. 71 [1]: 49-51. Horner, B.E., G.L. Potter, and S. Van Ooteghem) continues to be maintained at Smith College. Although inbred for several generations, the mice retain their high level of breeding productivity and show no grossly detectable changes in morphology or behavior. Since 1977 various numbers of these black mice have been sent to individual investigators at the following institutions: Cornell University, Yale University, University of Wisconsin, University of California at Riverside, University of South Carolina, and University of Michigan. The animals sent to Cornell, to Bruce A. Brewer, have recently accompanied him to his present position at the Brookfield Zoo, where they are being maintained as a breeding colony of exhibit interest as well as of research value. Support for the maintenance of the non-agouti stock of mice at Smith College has been provided, in part, by the Blakeslee Fund of Genetics Research at Smith College, a fund established by bequest of geneticist Albert F. Blakeslee. It is anticipated that modest numbers of the mice will continue to be available to investigators until January, 1987, at which time the Smith colony very probably will be terminated.

* * *

John S. MILLAR
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Co-workers:
Stewart Lusk
Sean Sharpe

Peromyscus research at the University of Western Ontario:

We currently maintain three breeding stocks of **Peromyscus**. 1. **Peromyscus maniculatus nebrascensis** from south eastern Alberta. 2. **Peromyscus maniculatus artemisiae** from south central British Columbia. 3. **Peromyscus maniculatus keeni** (?) from Moresby Island, British Columbia. (obtained from Michael Earl, University of Guelph).

P.m.n. are being used in a selection experiment for early maturation. The reproductive and developmental patterns of **P.m.a.** and **P.m.k.** are being documented.

In addition, field studies are being conducted on **P.m. borealis** in the Kananaskis Valley, Alberta. Stewart Lusk is conducting and experimental study of reproductive inhibition of young females. Sean Sharpe is examining asynchronous breeding among overwintered females.

* * *

Robert K. ROSE
Department of Biological Sciences
Old Dominion University
Norfolk VA 23508

My interests in **Peromyscus** relate to the ecology of populations of **Peromyscus** in coastal plain forests in eastern Virginia, primarily in the Dismal Swamp. The population densities of **Peromyscus leucopus** appear to be unusually low in the Dismal Swamp, probably in response to the irregular supply of food from a few species of trees and the few shrubs, as well as because of the difficulties of securing food during the winter when large areas of the Swamp are inundated. One graduate student (Breidling) examined food availability throughout the year in four different forest types in the Dismal Swamp, and another (Walke) used nest boxes with and without supplemental food to evaluate the populations of **P. leucopus** and **Ochrotomys nuttalli**there. Both species used the nest boxes (No. 10 tin cans) as feeding stations, refuges, and even for nesting and raising young. Supplemental food was useful in promoting the acceptance and use of the nest boxes.

Peromyscus gossypinus formerly was a member of the small mammal community in the forests of the Dismal Swamp, and probably of similar forests in the region. However, the last record of the cotton mouse dates from the 1930's in the Dismal Swamp (Dice and Hayne, I believe). I have caught one mouse that might have been a cotton mouse, and there is a chance that some locality might have a population. Southeastern Virginia is considered to be the northern edge of the distribution of the cotton mouse.

* * *

Frederick B. STANGL, Jr.
Midwestern State University
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Wichita Falls TX 76308-2099

Co-worker:
Walter W. Dalquest

Recent cytogenetic studies (Stangl) have involved systematic relationships of **Peromyscus** species, distribution of cytotypes of **P. leucopus**, and characterization of the hybrid zone between the two described cytotypes of **P. leucopus**. At present, ecological and zoogeographical distribution of small mammals, to include **Peromyscus** species, from Texas and New Mexico, is the focus of our (Stangl and Dalquest) studies. Electrophoretic tissues of many of our specimens from these areas (and northcentral Texas as well) are deposited at The Museum, Texas Tech University, Lubbock, Texas with Dr. Robert J. Baker. Live specimens of northcentral Texas species (**maniculatus**, **leucopus**, and **attwateri**) and west Texas forms (**boylii**, **pectoralis**, **eremicus**, **maniculatus**, and **leucopus**) may be available at such times that coincide with our field activities.
--Frederick B. Stangl, Jr., and Walter W. Dalquest

Dept. of Biology, Midwestern State University, Wichita Falls, TX 76308

* * *

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Population Ecology and Social Behavior of **Peromyscus leucopus** and **Peromyscus maniculatus**

From 1980 to 1985 we have been studying the population ecology and social behavior of **Peromyscus leucopus noveboracensis** and **P. maniculatus nubiterrae** where they are sympatric in mixed deciduous forests of the southern Appalachian Mountains (study conducted at the Mountain Lake Biological Station). These two species are morphologically and behaviorally similar, and act ecologically as a single species, though they do not interbreed. The study area and methods have been described in previous publications and are cited below. Our experiments and studies have produced the following results.

Species similarities

An analysis of the stomach contents of 109 **P. maniculatus** revealed a diet similarity of 96.1% (Wolff et al. 1985). The diets consisted primarily of arthropods, fruits, seeds, and green vegetation. Both species increased slightly on food-addition grids during high densities in 1981, but not during low densities from 1982 through 1984 (Gerzoff, 1984; Wolff, 1986). Food does not appear to be a major factor limiting population growth. Approximately 45% of the captures of **P. maniculatus** and 22% of **P.**

leucopus captures were in trees. **Peromyscus maniculatus** nests almost exclusively above 4 m in large hollow trees. **Peromyscus leucopus** is more variable in use of nest sites with 46 percent of nests being underground. Arboreal nests of **P. leucopus** are usually in smaller trees than those of **P. maniculatus** and they are usually closer to the ground (Wolff and Hurlbutt, 1982; Woff and Durr, 1986). During winter, **P. leucopus** nest exclusively underground, while **P. maniculatus** remain in arboreal nests (Wolff and Durr, 1986).

Population Ecology and Social Behavior

A total of 1,868 **P. leucopus** and 754 **P. maniculatus** were caught 13,630 times on control grids from 1981 through 1985 (Wolff, 1985a; unpubl.). The population density of both species declined from a high of 58 animals/ha in June 1981 to a low of 6 animals/ha in May 1983, and then increased to 19 animals/ha in 1985. The reproductive season for both species was bimodal with peak activity in April-June and September-October with a midsummer lull (Wolff, 1985a; 1986). A food supplement in July-August did not prevent the midsummer hiatus in breeding activity (Wolff, 1986).

An electrophoretic analysis revealed significant differences in allele frequencies between 1981 and 1984 at 13 of 23 polymorphic loci for **P. leucopus** and 8 of 17 polymorphic loci for **P. maniculatus**. It is not known if these changes were a random event or represented selection resulting from intrinsic or extrinsic factors.

Home ranges averaged 590 m2 and did not differ between species or ages, but males had slightly larger home ranges than females (Wolff, 1985b). Females had smaller home ranges on food-addition grids than on control grids, but males did not. At low densities individuals of the same sex maintained exclusive home ranges, however, home ranges of males and females overlapped each other considerably (Wolff, 1985b). At relatively high densities of 25 to 58 mice/ha in 1981, both species exhibited intra- and interspecific territoriality within each sex (Wolff et al. 1983). As the population decreased in 1982 and 1983, animals were not aggressive and home ranges were maintained by mutual avoidance (Wolff, 1985b).

The functions of territories in **Peromyscus** appear to be different for males and females. Males are teritorial to provide access to reproductive females, and females are territorial to prevent infanticide (Wolff, 1985c).

Baccus and Wolff (in prep.) estimated that up to 33% of the litters of **P. leucopus** were sired by more than one male. We also have electrophoretic evidence that both males and females mate promiscuously.

Using radioisotopes to label embryos in utero, we have been able to identify mothers and their offspring (Wolff and Lundy, 1985). We found that juvenile males disappear from grids (disperse) twice as fast as juvenile females having mean lengths of residence of 5.7 and 10.6 weeks, respectively. Among juveniles 0% of males and 30% of females attained sexual maturity and bred within their maternal home range. Adult females will sometimes abandon their orginal home range after weaning their first litter and let their daughter's inherit it. Dispersal favoring juvenile males prevents mother-son and brother-sister matings. We have found no aggression between adults and juveniles so apparently juvenile males disperse "voluntarily" and are not "forced" by adult aggression.

Work in Progress and Proposed Studies

1. Determine dispersion patterns of relatives during the breeding season to measure gene flow and coefficients of inbreeding.
2. Compare aggression and other social behavior between kin and nonkin.
3. Correlate changes in aggression with population density and with any genetic changes in population structure.
4. Discern between alternative functions for dispersal.
5. Determine the role of aggression in dispersal and colonization.

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