

THE AMPHIBIANS AND REPTILES OF MONTGOMERY COUNTY, TENNESSEE¹

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ABSTRACT

A survey of the amphibians and reptiles of Montgomery County, Tennessee was conducted during 1966 and the first half of 1967, using standard methods of collection and preservation.

Fifty-seven of an expected 66 species were collected. Five unexpected forms (*Ambystoma talpoideum*, *Hyla avivoca avivoca*, *Hyla gratiosa*, *Natrix erythrogaster neglecta*, and *Agkistrodon piscivorus leucostoma*) were taken, representing new distribution records, and raising the total of forms known or expected to occur in the county to 71. Five intergrading populations of eastern and western races were encountered.

Neoteny was observed in *Ambystoma talpoideum*.

The herpetofauna of Montgomery County is divisible into three categories according to habitat utilization throughout their ranges. With two exceptions, the occurrence of forms unexpected in the county is thought to be associated with the presence of appropriate habitats in the Cumberland River Valley, these connecting via that valley to more extensive and typical habitats in the Ohio and Mississippi River Valleys. The contiguity of major physiographic types within the county accounts for the relatively large amount of intergradation observed.

INTRODUCTION

Published information concerning the taxonomy and local life histories of the amphibians and reptiles of Middle Tennessee is scanty, compared to that of East and West Tennessee. Although the herptiles of the area have been sampled in general by Sinclair (1950) and Gentry (1955, 1956), and locally for salamanders in Davidson County by Ashton (1966), more knowledge is needed to describe adequately the forms inhabiting the central portion of the state. This paper supplies some information by relating the results of a study conducted during 1966 and the first half of 1967. An annotated check list of the species and subspecies of herptiles known or expected to occur in Montgomery County is presented.

DESCRIPTION OF STUDY AREA

Montgomery County, Tennessee, lies on the northwestern Highland Rim (Fig. 1), and is underlain primarily by St. Louis and Warsaw Limestones, with some deposits of St. Genevieve Limestone surfacing in the northern quarter (Hardeman et al. 1966). The county is covered with white chert soils, red soils, (Wilson 1958), and alluvial deposits along the Cumberland and Red Rivers which drain the region. The larger Cumberland enters from the southeast and flows northwest to Clarksville, where it turns and runs southwest into Stewart County. Red River enters the county from the northeast, at Port Royal, and flows to its confluence with the Cumberland River at Clarksville.

The topography of Montgomery County is rolling to hilly in the south and central portions, becoming

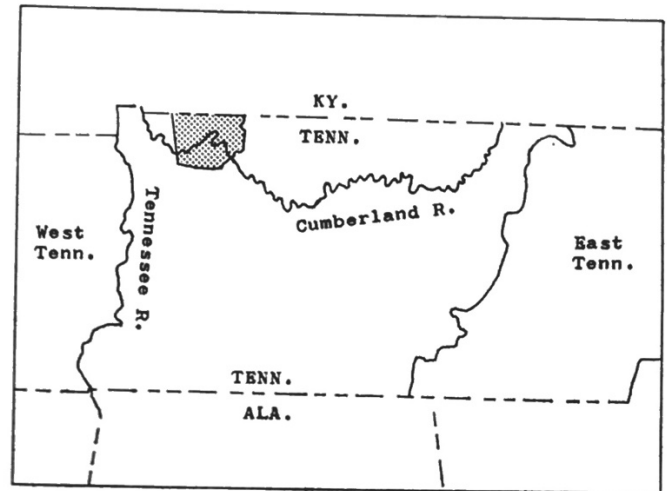


Figure 1. Location of Montgomery County in Middle Tennessee.

relatively level in certain northern areas, the latter representing a portion of the Kentucky prairie barrens as mapped by Transeau (1935). Topographic features of particular interest to the herpetologist are the many sloughs along the Cumberland River and the numerous sinkholes that occur throughout the county. The average elevation is 500 feet (Killebrew 1870).

Montgomery County has a humid, mesothermal climate with little or no water deficiency in any season (Thorntwaite 1948). More specific weather data (based on weather records taken at the Clarksville weather station) are as follows: The mean annual precipitation is 48 inches, with a maximum in January and a minimum in September. The mean January temperature is 39.3° F., whereas the mean for July is 79.7°. Mean dates for the first and last killing frosts are October 26 and April 3, respectively.

Floristically, Montgomery County is within the Western Mesophytic Forest Region of the Deciduous Forest Formation (Braun 1950). Its woody vegetation consists principally of oaks and hickories, with mesophytic and hydrophytic species occupying streambank and bottomland habitats (Duncan 1965). The prairie bar-

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rens have been practically eliminated by cultivation, but are reported by Shanks (1958) to have been "floristically similar to the prairies of the middle west, with relatively few plants of coastal plain affinities, and very infrequent occurrence of woody mesophytes."

MATERIALS AND METHODS

General collecting methods used for both amphibians and reptiles included: Seining; overturning logs, stones and other debris in likely habitats; scouting both graveled and hard-surfaced roads at night, especially during or after periods of rain. Special efforts, such as setting trotlines and wading the shallows of the two major river systems were employed in collecting the more aquatic salamanders of the genera *Cryptobranchus* and *Necturus*. Frogs were taken by hand and with dip nets. Wire funnel traps were used to capture turtles. Lizards and some snakes were collected by hand and in some cases by the use of .22 caliber bird shot discharged from a smoothbore gun. Specimens were preserved in 10 percent formalin, labeled and stored in accordance with standard museum procedures.

In addition to collections made during the study, specimens in the Austin Peay State University Museum of Zoology (APMZ) were surveyed and the results incorporated into the findings. All specimens are now in the Austin Peay State University collection.

RESULTS

Sixty-six species of herptiles were anticipated to occur in Montgomery County (Gentry 1955, 1956; Conant 1958; Ashton 1966). Of these, 57 were collected. Five unexpected species were taken, thus establishing new distribution records outside their previously reported ranges and raising the total of forms known or expected to occur in the county to 71. A comparison by Orders of the number of species expected and the number collected appears in Table I.

TABLE I

A COMPARISON BY ORDERS OF THE NUMBERS OF SPECIES OF AMPHIBIANS AND REPTILES EXPECTED AND COLLECTED IN MONTGOMERY COUNTY, TENNESSEE

Order	originally expected	collected	expected but not collected	collected, not originally expected	now expected
Caudata	17	15	3	1	18
Salientia	13	14	1	2	15
Chelonia	11	8	3	—	11
Sauria	5	4	1	—	5
Serpentes	20	21	1	2	22
Totals	66	62	9	5	71

The forms for which range extensions were established were: *Ambystoma talpoideum* (APMZ Nos. 1393 and 1394), *Hyla gratiosa* (APMZ Nos. 1390, 1391, and 1392), *Hyla avivoca avivoca* (APMZ Nos. 1395 and 1396), *Natrix erythrogaster neglecta* (APMZ No.

1397), and *Agkistrodon piscivorus leucostoma* (APMZ No. 1398).

Evidence of intergradation between subspecific forms existed in several cases, as noted in the check list. Presumed hybrids between *Bufo americanus americanus* and *Bufo woodhousei fowleri* were collected.

Neoteny was observed in one species, *Ambystoma talpoideum*. Several large larvae (larger than normal adults) were collected from a woodland pond in early February, 1966, and placed in a wire cage submerged in tap water. The following morning a small, fragile mass of eggs was discovered attached to the wire. This find prompted the dissection of two larvae, both of which contained fully developed eggs. The remaining larvae were placed in an aquarium filled with tap water. Within ten days the gills had begun shortening and by the end of the third week all had transformed into apparently normal adults. Other reports of neoteny in this species come from Carr and Goin (1943) and Volpe and Shoop (1963).

ANNOTATED CHECK LIST OF THE AMPHIBIANS AND REPTILES OF MONTGOMERY COUNTY, TENNESSEE

Scientific and common names in the following check list correspond to those used by Conant (1958), except where noted.

SPECIES COLLECTED IN MONTGOMERY COUNTY

Cryptobranchus alleganiensis alleganiensis (Daudin). Hellbender. Common in Cumberland and Red Rivers, and probably their larger tributaries.

Necturus maculosus maculosus (Refinesque). Mudpuppy. Several were collected during February from the Cumberland River, on a trotline baited with minnows.

Ambystoma maculatum (Shaw). Spotted Salamander. Sexually active adults and fresh eggs were collected from a woodland pond on the nights of February 11 and 28.

Ambystoma opacum (Gravenhurst). Marbled Salamander. Two females were uncovered on their nests among the leaves of a dry woodland pond in October. Another individual, not on a nest, was taken during the same month from under a decaying log at the edge of a slough.

Ambystoma talpoideum (Holbrook). Mole Salamander. Until Brigham, Gnilka, and Dimmick (1967) reported a population of this species from Putnam County, only one record of its existence in Middle Tennessee had been reported (Gentry 1955). The population discovered during the present study was about 100 miles west of the Putnam County record and approximately 50 miles east of the West Tennessee population as mapped by Conant (1958). However, it was only about 10 miles north of the "uncertain boundary" of the eastward segment of the range as

mapped by Shoop (1964). In Montgomery County, this species was observed breeding in a woodland pond on February 11 and 28.

Ambystoma texanum (Matthes). Small-mouthed Salamander. A sexually active male was taken from a road during a rain on the evening of December 8, 1966. In February of that year a female was collected by seining a shallow pond in an open field.

Ambystoma tigrinum tigrinum (Green). Eastern Tiger Salamander. Common throughout the county. Observed in breeding condition in December, January, and February.

Diemictylus viridescens viridescens (Rafinesque) X *D. v. louisianensis* (Wolterstorff). Newt. Common in fishless ponds throughout the county. In a series of 41 *D. viridescens*, 19 were classified as typical *D. v. viridescens*, the Red-spotted Newt, nine as *D. v. louisianensis*, the Central Newt, and the remaining 13, as intermediate between the two.

Desmognathus fuscus conanti Rossman. Spotted Dusky Salamander. This very common salamander of rocky streams was considered as part of the *D. f. fuscus* complex until Rossman (1958b) described it from Livingston County, Kentucky and found it in two counties bordering Montgomery County to the south and east. Montgomery County specimens referred to Rossman were confirmed by him as belonging to the *conanti* group. Conant (1958) does not recognize this subspecies.

Eurycea bislineata rivicola Mittleman. Midwest Two-lined Salamander. Frequently taken from under stones at the edges of small intermittent and permanent streams. Conant (1958) does not list this subspecies and shows only *E. b. bislineata* occurring in Middle Tennessee.

Eurycea longicauda longicauda (Green). Long-tailed Salamander. Frequently collected from under rocks at or near the edges of small rocky streams, and from beneath woodland debris.

Eurycea lucifuga Rafinesque. Cave Salamander. Found in a variety of habitats, usually in moist areas of limestone outcrops.

Plethodon dorsalis dorsalis Cope. Zigzag Salamander. Both dark and light phases were taken in moist, wooded habitats from under various kinds of debris.

Plethodon glutinosus glutinosus (Green). Slimy Salamander. Consistently taken from under or within decaying logs in wooded areas, and along stream margins.

Pseudotriton ruber ruber Sonnini. Northern Red Salamander. Several specimens were found under rocks and moist leaves in or near a spring-fed stream.

Scaphiopus holbrooki (Harlan). Eastern Spadefoot Toad. One specimen was collected in August from a newly plowed field.

Bufo americanus americanus Holbrook. American Toad. Fairly common throughout the county.

Bufo woodhousei fowleri Hinckley. Fowler's Toad. Common throughout the county.

Acris crepitans blanchardi Harper. Blanchard's Cricket Frog. Common near all types of permanent or semi-permanent bodies of water.

Hyla avivoca avivoca Viosca. Bird-voiced Treefrog. Apparently *Hyla avivoca avivoca* has not previously been recorded east of the Tennessee River in Tennessee (Conant 1958, Gentry 1955, Smith 1966). The specimens collected during this investigation were taken from calling perches three to six feet above the surface of the water in a slough along the Cumberland River west of Clarksville, and represent either an eastward range extension of approximately 40 miles of the West Tennessee population, or a disjunct colony.

Hyla crucifer crucifer Weid. Northern Spring Peeper. Common in many small woodland ponds and temporary pools from February to July.

Hyla gratiosa Le Conte. Barking Treefrog. Two specimens of this species were collected in northeastern Montgomery County during May, 1966, but were incorrectly identified as *Hyla cinerea*, and reported as such in a paper presented at the seventy-sixth meeting of the Tennessee Academy of Science (Scott and Snyder 1967). The acquisition of a third specimen collected in the same area, but about a year later than the original two, prompted reexamination of the preserved material, whereupon it became apparent that all three individuals were *Hyla gratiosa*. This identification was confirmed by Dr. Coleman J. Goin of the University of Florida. These were then reported as the first records of this species from Tennessee (Scott and Harker 1968). However, it was later learned that Rossman (1958b) had taken one adult female on the porch of a motel ½ mile south of Sparta in White County, Tennessee. The Montgomery County records are approximately 110 miles northwest of the White County record and at least 130 miles north of the previously known range of the species (Wright and Wright 1949, Conant 1958). Therefore, it does not seem reasonable to propose a continuous range extension. However, the separate collection sites and dates in Montgomery County do suggest a well-established, disjunct population in northern Tennessee.

Hyla versicolor versicolor Le Conte. Eastern Gray Treefrog. Common in wooded and brushy areas from late spring through the summer months.

Pseudacris triseriata feriarum (Baird). Upland Chorus Frog. Breeding choruses were very common in shallow ponds, temporary pools, and in drainage ditches from January until June.

Rana catesbeiana Shaw. Bullfrog. Very common about all types of permanent bodies of water, chiefly the larger lakes, ponds, and streams.

Rana clamitans melanota (Rafinesque). Green Frog. Several were found under rocks along small streams. Ventral vermiculations suggest intergradation with *R. c. clamitans*.

Rana palustris Le Conte. Pickerel Frog. Uncommon, occupying habitats similar to that of *R. clamitans*.

Rana pipiens sphenoccephala Cope. Southern Leopard Frog. Common around farm ponds and lakes, often ranging far from water.

Chelydra serpentina serpentina (Linnaeus). Common Snapping Turtle. Common in ponds and larger streams throughout the county.

Kinosternon subrubrum subrubrum (Lacépède). Eastern Mud Turtle. One specimen was taken on land just after a thunder storm.

Sternotherus odoratus (Latreille). Stinkpot. Taken from sloughs in the Cumberland River floodplain southeast of Clarksville.

Chrysemys picta marginata Agassiz X *C. p. dorsalis* Agassiz. Painted Turtle. Collected from floodplain sloughs and farm ponds throughout the county. All specimens taken possessed characteristics typical of *C. p. marginata* except that they had a thin, red, middorsal stripe, typical of *C. p. dorsalis*.

Gratemys geographica (Le Sueur). Map Turtle. One immature specimen was collected from West Fork Creek.

Pseudemys scripta elegans (Weid). Red-eared Turtle. Common in rivers, large creeks, and ponds throughout the county.

Terrapene carolina carolina (Linnaeus). Eastern Box Turtle. Common in wooded areas throughout the county.

Trionyx spinifer spinifer Le Sueur. Eastern Spiny Softshell. Taken from both the Cumberland and Red Rivers.

Sceloporus undulatus hyacinthinus (Green). Northern Fence Lizard. Frequently collected among debris at old homesites and from fallen trees in dry situations throughout the county.

Cnemidophorus sexlineatus (Linnaeus). Six-lined Racerunner. One population was discovered occupying dry habitats along the Tennessee Central Railroad about four miles west of Clarksville.

Eumeces fasciatus (Linnaeus). Five-lined Skink. Frequently collected from under debris in vacant lots throughout the city of Clarksville. Also taken from under logs and stones in wooded habitats, usually near streams.

Lygosoma laterale (Say). Ground Skink. Commonly taken from under decaying logs or debris where there was a moderate amount of moisture.

Carphophis amoenus helenae (Kennicott). Midwest Worm Snake. Several specimens were taken from beneath stones and logs in wooded habitats.

Coluber constrictor constrictor Linnaeus. Northern Black Racer. Common in open areas throughout the county.

Diadophis punctatus edwardsi (Merrem) X *D. p. stictogenys* Cope. Ringneck Snake. Specimens were found in both open and wooded habitats. Variation in chin spotting, ventral pattern and number of supralabials all suggest the existence of intergradation between Northern and Mississippi Ringneck Snakes in Montgomery County.

Elaphe obsoleta spiloides Dumeril, Bibron, Dumeril. Gray Rat Snake. Common throughout the county. Although Conant (1958) indicates that only *E. o. obsoleta* occurs in Montgomery County, none were collected during this study. All specimens taken are considered to be *E. o. spiloides* because of the retention of body pattern into adulthood.

Haldea valeriae elegans Kennicott. Western Smooth Earth Snake. Two specimens were collected from wooded areas.

Heterodon platyrhinus Latreille. Eastern Hognose Snake. One specimen was taken from a wooded habitat along the Cumberland River at Clarksville.

Lampropeltis calligaster calligaster (Harlan). Prairie Kingsnake. Several specimens were found dead on the roads. Living specimens were taken occasionally, from open areas.

Lampropeltis doliata sypila (Cope). Red Milk Snake. One immature specimen was collected.

Lampropeltis getulus niger (Yarrow). Black Kingsnake. One specimen was collected dead on the road.

Natrix erythrogaster neglecta Conant. Copper-bellied Water Snake. Specimens were taken from a slough along the Cumberland River about 60 miles southeast of Conant's (1958) proposed range limits. Although an intergrading population with *N. e. flavigaster* has been reported in extreme northwest Tennessee (Conant 1949), this seems to be the first report of an apparently pure population in the state.

Natrix septemvittata (Say). Queen Snake. Frequently collected from small rocky streams throughout the county.

Natrix sipedon sipedon (Linnaeus). Northern Water Snake. Common about streams, ponds, and rivers throughout the county.

Ophedrys aestivus (Linnaeus). Rough Green Snake. Several specimens were collected from small trees and shrubs.

Pituophis melanoleucus melanoleucus Barbour. Northern Pine Snake. One specimen was taken on a gravel road during the first part of May.

Storeria dekayi wrightorum Trapido. Midland Brown Snake. Common throughout the county, especially so in the city of Clarksville.

Storeria occipitomaculata occipitomaculata (Storer). Northern Red-bellied Snake. One specimen was collected from under a board near a tobacco barn.

Thamnophis sauritus sauritus Linnaeus. Eastern Ribbon Snake. One specimen was taken from leaf litter near a temporary woodland pond.

Thamnophis sirtalis sirtalis (Linnaeus). Eastern Garter Snake. Common among rubble and debris in vacant lots in Clarksville, and in open rural areas.

Agkistrodon contortrix mokeson (Daudin). Northern Copperhead. Fairly common in wooded areas throughout the county. Some specimens show influence of intergradation with *A. c. contortrix* by having a relatively paler color and thinner dorsal crossbands that are sometimes interrupted.

Agkistrodon piscivorus leucostoma (Troost). Western Cottonmouth. During the present study specimens were collected from sloughs along the Cumberland River. Although Conant (1958) and Wright and Wright (1957) show the range of this subspecies extending into Middle Tennessee, no records of its occurrence east of the Tennessee River were found. Gentry (1956) listed this subspecies from West Tennessee only.

Crotalus horridus horridus Linnaeus. Timber Rattlesnake. One specimen was taken near the Stewart-Montgomery County line.

SPECIES EXPECTED, BUT NOT COLLECTED IN MONTGOMERY COUNTY

Siren intermedia nettingi Goin. Western Lesser Siren. Known to occur in Cumberland River both upstream and downstream from Montgomery County, but not collected in the county.

Eurycea aquatica Rose and Bush. No common name. Although this newly described salamander (Rose and Bush 1963) was not collected in Montgomery County, Ashton (1966) predicted its range to include all of Middle Tennessee and possibly parts of southern Kentucky.

Hemidactylium scutatum (Schlegel). Four-toed Salamander.

Rana sylvatica Le Conte. Wood Frog.

Gratemys pseudogeographica ouachitensis Cagle. Ouachita Map Turtle.

Pseudemys concinna hieroglyphica (Holbrook). Slider.

Trionyx muticus Le Sueur. Smooth Softshell.

Eumeces laticeps (Schneider). Broad-headed Skink.

Tantilla coronata coronata Baird and Girard. South-eastern Crowned Snake.

DISCUSSION

The herpetofauna of Montgomery County can be divided into three categories according to habitat: (1) species typical of lowland habitats of the Mississippi Embayment and Coastal Plain; (2) species typical

of upland habitats of the Interior Low Plateau; and (3) species occurring regularly in both lowland and upland habitats. About 50% of the forms collected during this study belong to the third category and were taken regularly from both types of habitats. Some 40% belong to the second category and were consistently taken from upland areas. The remaining 10%, including all unexpected forms, belong to the first category and were usually taken in lowland areas. However, *Ambystoma talpoideum* and *Hyla gratiosa* were found only in upland habitats. Excluding the two species mentioned above, the occurrence of forms unexpected in the county is thought to be associated with the presence of appropriate habitats in the Cumberland River Valley, these connecting via that valley to more extensive and typical habitats in the Ohio and Mississippi River Valleys.

Intergradation between subspecific forms of amphibians and reptiles of Montgomery County is rather common but not surprising, due to the location of the county in a region of interdigitation of upland habitats to the east and lowland habitats to the west. In a situation such as this, interbreeding and consequent genetic exchange between populations adapted to the two major habitat types would be expected. More data are needed before the extent of the intergradation can be determined.

The first author wishes to express his sincere thanks to his wife, Billie, for her aid and encouragement in the field and during the preparation of this paper. Appreciation is also extended to Dr. Floyd M. Ford and Dr. Wayne Chester for their helpful and constructive criticism of the manuscript. To Dr. Douglas A. Rossman, Dr. Roger Barbour, and Dr. Coleman J. Goin, much thanks is due for their aid in identification. The authors are also indebted to Messrs. Donald F. Harker, John Cook, and Mike Sawyer, and to the many students who gave of their time and efforts in field work.

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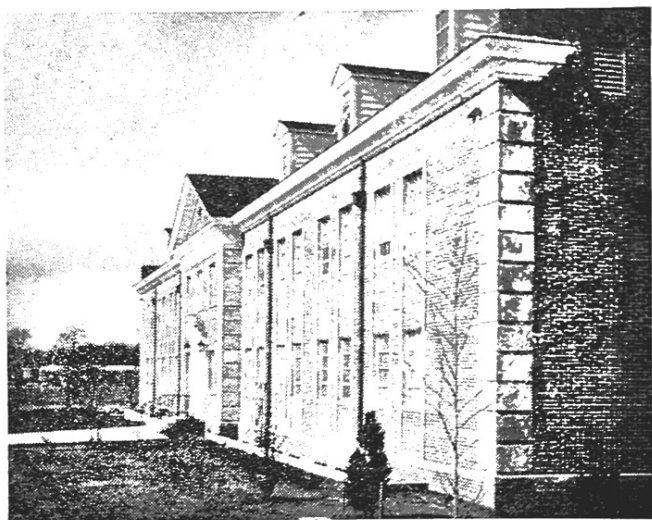
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ADDENDUM

Since the above information was submitted another unexpected species has been collected. On the morning of August 18, 1968 one adult male *Ophisaurus attenuatus longicaudus* (snout-vent length = 295 mm) was killed crossing blacktopped Manning Road, six air miles southwest of Clarksville in western Montgomery County. This record is approximately 50 air miles northwest of the Davidson County record of Gentry (1956) and is apparently the first record of this species from the northwestern Highland Rim in Middle Tennessee. The specimen is in the Austin Peay Museum of Zoology, APMZ No. 2373.

News of Tennessee Science— (Continued from Page 78)



Electrical and Mechanical Engineering Building at Tennessee Technological University.

The Third building of the Engineering Complex was completed and occupied during the Winter Quarter, 1968. The Departments of Electrical, Mechanical, and Chemical Engineering are housed in this new building containing 56,000 sq. ft. of laboratory, office, and classroom space.

Collegiate Division News—The Collegiate Division of the Tennessee Academy of Science, Western Region, held its annual spring meeting at Bethel College on May 4.

The Middle Tennessee Tennessee Regional meeting was held at Vanderbilt University on the same date. NOTE: Administrators are urged to send items of interest for News of Tennessee Science (staff changes, grants awarded, new facilities, meetings, etc.) to Robert E. Martin, News Editor, Box 52A, Tennessee Tech-



Biology Building at Tennessee Technological University.

The new Biology Building was completed and occupied during the Spring Quarter, 1968. The building will house the Departments of Biology and Agriculture in approximately 60,000 sq. ft. of laboratory, office, and classroom space.

nological University, Cookeville, Tennessee 38501. Your cooperation is needed in these communications.

ERRATA

Vol. 42, p. 49. G. Gorin was joint author of the abstract entitled *Some Observations on the Sulfhydryl Reactivity and the Enzymatic Activity of Yeast Alcohol Dehydrogenase*.

Vol. 42, p. 134. Airee, S. K. was incorrectly presented as Aire, K. K.