FIG. 1.

FIG. 2.

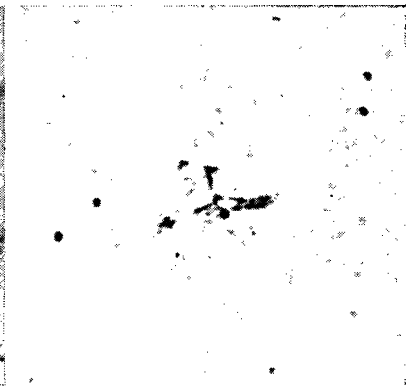

FIG. 3.

microtome into sections, 15 μ in thickness. The sections were transferred to 250 cc of potassium phosphate and citric acid buffer solution (pH 7, ionic strength 0.25, temperature 0° C) containing 5.0 cc of a 0.4% filtered solution of commercial trypsin. Sample sections were removed periodically, mounted under a cover slip and studied microscopically. When gentle pressure on the cover slip was sufficient to rupture the sarcolemma (Fig. 1) and permit the escape of segregated myofibrils (usually after 30–45 min of tryptic digestion), the sections were filtered from the enzyme buffer solution, washed, and resuspended in a potassium phosphate and citric acid buffer solution (pH 6.4, ionic strength 0.25). This suspension was agitated in a Waring blender for 5–10 sec. During this treatment the sarcolemma ruptured and myofibrils were released. This crude preparation was purified by repeated washing and centrifugation at 0° C. The final suspension of myofibrils formed a white flocculent mass containing only microscopic traces of collagenous and cellular debris. The myofibrils, usually single, but occasionally adherent in groups of two or more, were elongated, birefringent rods measuring 0.25–1.2 μ in diameter in fixed preparations. "A" and "I" disks were distinct but "Z" lines were rarely seen (Fig. 2).

The solubility of the myofibrils was studied microscopically. They promptly dissolved in 5–10 volumes of a cold aqueous alkaline solvent (0.5 M potassium chloride, 0.03 M sodium bicarbonate) yielding a viscous solution showing birefringence of flow. In cold buffer solutions (pH 1–12, ionic strength 0.15), the myofibrils dissolved in the ranges: pH 1–4, and pH 10–12.

The influence of ionic strength and potassium chloride on the solubility of myofibrils was determined by adding potassium chloride to cold phosphate and borate buffer solutions (pH 6–11, ionic strength 0.05). The myofibrils dissolved in solutions (ionic strength 0.2) alkaline to pH 10; in solutions (ionic strength 0.3) alkaline to pH 8; and in solutions (ionic strength 0.5) alkaline to pH 6. Comparable results were obtained with potassium phosphate buffer solutions of varying ionic strength and pH.

When isolated myofibrils under direct microscopic observation were immersed in a solution (0.075%) of adenosine diphosphate and triphosphate at room temperature, they spontaneously and rapidly contracted into small round masses. This contraction was not reversible (Fig. 3).

Paleocene and Eocene Strata in the Bearpaw Mountains, Montana[1]

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The dark, rounded features of the Bearpaw Mountains, rising some 4,500 ft above the surrounding plains in north central Montana, can be seen readily from railroad or highway between Chinook and Havre or between Havre and Big Sandy. Centennial Mountain, the most conspicuous land form in the western part of the mountains, has the appearance of a sleeping bear. This resemblance and the Indian legend associating the mountain with a prominent adjacent butte near Box Elder provided the original name "Mountain of the Bear's Paw." The softened contours of the Bearpaws are in large part the result of normal differential erosion of diverse rocks plus the effect of a forest mantle consisting of Douglas fir, ponderosa and lodgepole pines, cottonwood, aspen, white birch, service berry, cherry, hawthorn, rose, raspberry, alder, and dogwood—in brief, an outpost of the Rocky Mountain flora, 150 miles distant.

In this Bearpaw region irruptive magmas (now stocks, plugs, dikes, sills, laccoliths, flows, and agglomerate piles) in the Tertiary penetrated and at times overflowed a terrane originally of nearly horizontal sedimentary strata of late Mesozoic and early Tertiary age. These sedimentary formations exposed in and around the mountains are now tilted and faulted, with fault blocks of widely differing ages abutting against one another (7). The resulting complex geologic relations are unfortunately somewhat obscured in large areas by glacial deposits and bench gravel. The junior author began his geologic studies in 1937 with particular emphasis on the petrology

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of the mountains (*3, 4, 5*), but for a few days in 1940 and in the period August 13–22, 1948, the senior author joined in the field study of specific stratigraphic problems where paleobotanical experience was needed.

The identity of the coal-bearing strata several hundred feet stratigraphically above the marine Bearpaw shale (Cretaceous) in the southern part of the mountains has been subject to controversy for many years. These beds were identified in 1912 and 1914 as Fort Union by F. H. Knowlton for Pepperberg (*6*) and Bowen (*1*). In 1925, Reeves (*7*), on the basis of lithologic similarity to rocks of other regions with which he was familiar, designated the strata as Lance rather than Fort Union. In new collections recently made by the writers from carbonaceous shales and clays at the Ideal, Flatness, Blue Pony, Nygaard, Mackton, N L Ranch, and Nielsen Ranch coal mines and prospects are the following plants: *Glyptostrobus dakotensis, Sequoia* (*Metasequoia*) sp., *Cercidiphyllum arcticum, Aralia notata, Viburnum antiquum,* and *Viburnum asperum.* This is clearly a Fort Union (Paleocene) assemblage and supports the earlier conclusions of Knowlton and Bowen.

The Fort Union formation in the Bearpaw Mountains is characterized by brownish yellow sandstones and coal beds. The total thickness of the formation is not known but the portion exposed is in excess of 200 ft. The Judith River formation (Cretaceous), stratigraphically underlying the Bearpaw shale, also contains coal beds mined and prospected in the northern part of the mountains. The coal of the Judith River formation is, however, generally poorer in quality than that of the Fort Union formation. Associated carbonaceous shales and clays contain a diagnostic species of *Araucarites.* Several invertebrates also distinguish the Judith River formation.

Between the Fort Union formation and the Bearpaw shale is a coal-barren series of green-gray sandstones and thin shale beds. This section, in excess of 600 ft, is probably equivalent to the Fox Hills and Lance sequence that represents the uppermost Cretaceous sedimentation in this region.

Stratigraphically overlying the Fort Union formation, or faulted against it and older beds, is a sedimentary formation at least 450 ft thick, characterized in the basal part by a variegated sequence of sandstone and siliceous shale and in the upper part by sandstone and conglomerate. The dominant colors in the formation are red, purple, grayish yellow, and grayish green. A carbonaceous shale in the lower part of the formation yielded the floating fern *Salvinia preauriculata,* a diagnostic plant for the early Eocene in the Rocky Mountains and Plains region. The variegated beds yielded fragmentary remains of vertebrates (gar pike scales, turtles, and mammals). Of particular significance are a small, toothless, unidentified mammalian jaw and one somewhat worn molar tooth, identified by Dr. C. L. Gazin, of the U. S. National Museum, as resembling that of *Homogalax,* a tapirlike Eocene creature. Lithologically, the variegated sequence here assigned to the Wasatch formation, strikingly resembles the Wasatch in the Bighorn and Powder River Basins, Wyoming, where *Eohippus, Coryphodon, Diacodexis,* and many other Eocene mammals have been found.

The conglomerate in the upper part of the Wasatch formation in the Bearpaws represents boulder-channel deposits by streams of high gradient and is composed largely of quartzite like that of the Belt series (pre-Cambrian) in the Rocky Mountains. Other rocks present are limestone (Paleozoic), extrusive or intrusive porphyry, serpentine, and diorite-gabbro. None of the boulders is of local Bearpaw Mountain origin. Many of the boulders display pressure scars and accompanying fractures recemented by matrix sand, indicating effect of adjustment stresses attending or immediately following deposition of the boulders. Subsequent jointing of the indurated boulder bed produced secondary fractures in many of the boulders. Similarly bruised and fractured pebbles and boulders in conglomerate in Arizona were described by Campbell (*2*).

Uncomformably overlying the Wasatch formation in the southern Bearpaws are volcanic deposits of different compositions and ages. The oldest of these, principally latite, contains in the basal part tuffaceous beds that are plant-bearing. Remains of the following plants were identified: *Equisetum* sp., *Platanus* sp., *Aralia* sp., *Chaetoptelea* sp., *Laurus* sp., *Hydrangea* sp., and *Persea* sp. Some of the leaves are represented by only one fragment and consequently the species cannot be determined definitely at this writing. The general aspect of the assemblage, however, is that of other early or middle Eocene floras, in particular those of Yellowstone National Park and the Wind River Basin of Wyoming, but better collections may conceivably indicate a somewhat younger age.

The Eocene volcanic beds are of local Bearpaw Mountain origin. Their eruption was preceded by intrusions of monzonitic intrusive rocks and followed by a great variety of intrusive and extrusive igneous rocks, principally of alkalic affinity and presumably also of Eocene age.

It is evident that regional sedimentation in north central Montana continued into Eocene time, when it was interrupted locally by uplift and igneous activity. The Paleocene and Eocene formations, preserved in a few down-faulted blocks in the Bearpaw Mountains, were probably at one time continuous with formations of similar age now exposed in distant parts of Montana, Wyoming, and the Dakotas, the intervening portions having been removed by erosion. Thus, in the plains area of north central Montana, vertical fault displacements of about 2,000 ft preserved early Tertiary strata in downthrown blocks, and erosion in uplifted structures removed a stratigraphic section exceeding 5,000 ft in thickness.

In summary, the evidence here submitted establishes the existence in the Bearpaw Mountain region of coal-bearing strata of the Fort Union formation (Paleocene); of variegated and conglomeratic strata of the Wasatch formation (early Eocene); and of volcanic rocks of probable middle Eocene age. The first settles an old controversy; the second reveals strata not hitherto reported

and dated; and the third restricts the probable date of the beginning of volcanic activity in the region.

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Sex Differences in Blood Pressure of Dogs

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There have been numerous reports in the literature dealing with blood pressure values in presumably normal men and women. Recently Boynton and Todd (*1*) reported blood pressure determinations on 75,258 students at the University of Minnesota—truly a formidable number. There were 43,800 men and 31,458 women in the various age groups studied. The mean systolic blood pressure for men and women of all ages was 122 and 111 mm of Hg respectively; the diastolic was 74.5 and 69.7 mm of Hg respectively. In every age group, save that over 40, the mean systolic pressure in men significantly exceeded that in women. Other workers have reported similar differences in blood pressure between the sexes, although a minority of authors believes that there is no significant difference.

It was thought worth while, from the standpoint of comparative physiology, to study the problem in the dog, to see if significant differences in blood pressure exist there between the sexes. It was deemed impracticable to determine the blood pressure in dogs by the indirect method, that is, by use of the inflated cuff. Therefore, 147 anesthetized dogs were used. Sodium barbital was the anesthetic chosen and was given either intravenously or intraperitoneally (300 mg/Kg). In the latter instance it was given 60 to 90 min prior to the blood pressure determinations. Under surgical anesthesia, a cannula was inserted into the carotid artery and the blood pressure recorded by means of a mercury manometer. After the normal blood pressure readings had been ascertained, these animals were used for other experimental purposes, before recovering from the surgical anesthesia.

Table 1 shows the results obtained. The male dogs had, on the average, a blood pressure of 9 mm Hg higher than that of the females. This difference is also reflected in the median values: 132 mm Hg for the males; and 124–125 for the females.

Tatum and Parsons (*3*) in 1922 called attention to the desirability of using barbital as an anesthetic agent for dogs, since it had the significant property of preserving an approximately normal blood pressure. As far as known, furthermore, the barbiturates have the same effect on male as on female dogs, in contradistinction to the action of some of them on male and female rats. Our results are not entirely comparable to those of Hamilton (*2*), who found no significant differences in blood pressure values between the sexes in street dogs. His method differed from ours, in that he used light doses of morphine sulfate and in that our experiments were performed on unselected dogs. It was impossible for us to control the age factor, except for the fact that only adult dogs were used.

TABLE 1

Sex Differences in Blood Pressure in Dogs

Blood pressure range mm of Hg	Number of males	Number of females	Male average mm of Hg	Female average mm of Hg
60–79	0	1	...	60
80–99	3	6	91	92
100–119	12	24	111	110
120–139	28	24	129	128
140–159	14	23	150	147
160–179	9	2	165	166
180–199	1	0	190	....
60–199	67	80	134	125*
	Standard	Deviation :	21.5	20.7

* The difference (9 mm of Hg) between blood pressure for male and female dogs has a t value (according to Fisher) of 2.5803; for this value p is 0.011. The standard error of this difference is 3.50.

It is to be concluded from our data that in adult barbitalized dogs, males have a significantly ($p = 0.011$) higher mean systemic blood pressure than females by 9 mm Hg.

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A Metabolism Cage for Small Animals

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The cage designed by Henriques and Hansen (*3*) for the quantitative collection of urine and described by them in 1904 has undergone numerous modifications. Some of these have simplified the form and increased the ruggedness (*1, 2*) while others have overcome specific problems in quantitative collection (*4*). The modification described below falls into the last category and was designed to isolate the feces so that subsequent specimens of urine could not contact them. The value of this adap-