

Article XXXI. — THE SKULL OF CREOSAURUS.

By HENRY FAIRFIELD OSBORN.

The skull of the Jurassic Carnivorous Dinosaur *Creosaurus* is represented by two specimens, from the Bone Cabin Quarry, in the American Museum Collection, Nos. 600 and 666, which supplement each other admirably and give a very complete knowledge of all except the palatal region. The side and back view of No. 600 is presented in figures 1 and 2.

The chief features are: (1) the presence of three preorbital fenestræ, (2) the great elongation of the facial region, (3) the abbreviation of the temporal region, (4) the wide extension of the parietals on the occiput, (5) the deep depression of the quadrate and its rounded articular connection superiorly with the squamosal.

Proportions. — The skull is relatively high and narrow, the chief measurements being as follows:

	No. 600.	No. 666.
Length, occipital condyles to premaxillæ.....	810 mm.	885 mm.
Depth, parietal crest to distal extremity of quadrate.....	415	430
Width of occiput across parietals.....	...	230
Vertical measurement of quadrate.....	205	235

Openings. — The openings are placed as follows: (1) the paired narial openings, of elongate oval form, at the sides of the snout, bounded by the premaxillæ, nasals, and maxillæ; (2) the greatly abbreviated supratemporal fenestra; (3) the deeply extended latero-temporal fenestra (the post-temporal fenestra is entirely closed, and there is no pineal opening); (4) there is a slit-like foramen between the quadrate and quadratojugal; (5) the orbital openings are deeply vertical; (6) the preorbital fenestra, f' , is by far the largest vacuity in the skull, and is bounded by the maxillaries, prefrontals, and jugals; (7) a much smaller second preorbital fenestra, f'' , is bounded entirely by the maxillaries; (8) the third preorbital fenestra, f''' , lies between the premaxillaries and maxillaries, and is very small.

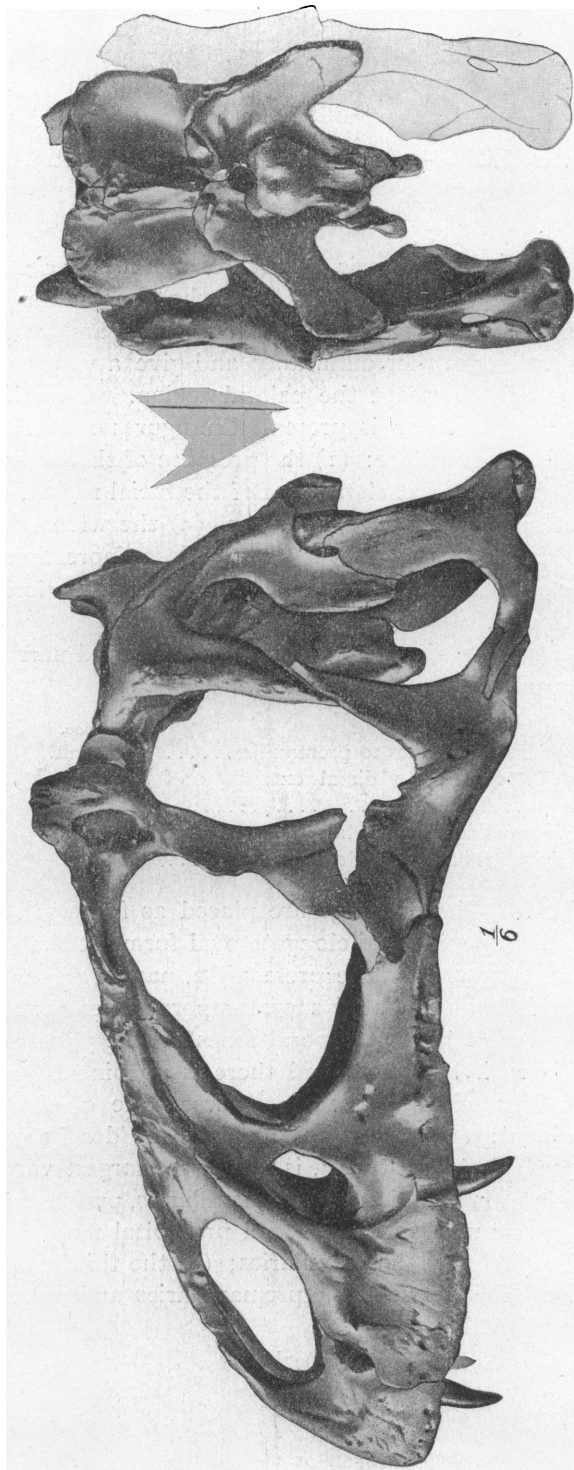


Fig. 1. Skull of *Cyasaurus atrox* Marsh. $\times \frac{1}{6}$.

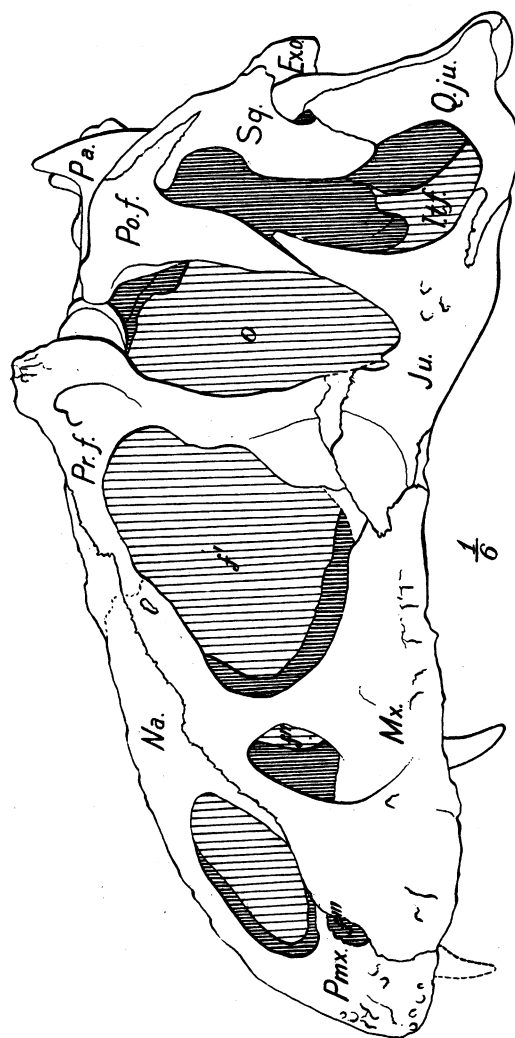
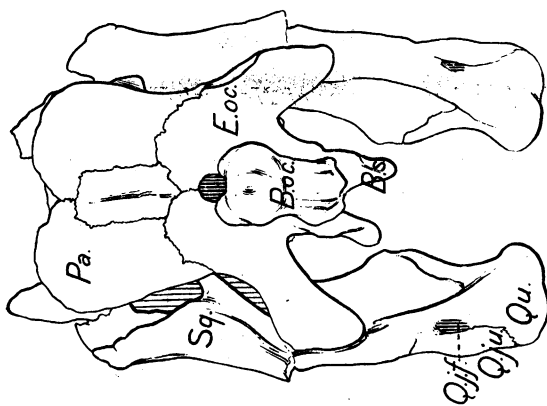


Fig. 2. Key to Fig. 1.

o, orbit.
*f*₁, first preorbital fenestra.
*f*₂, second preorbital fenestra.



*f*₃, third preorbital fenestra.
lt.f., laterotemporal fenestra.
Q.j.f., quadratojugal foramen.

The *premaxillaries* retain the alveoli of five teeth, and resemble the type premaxilla of *Creosaurus atrox*, a genus which, however, has not yet been clearly separated from *Allosaurus*.¹ The *maxillaries* contain the alveoli for from 16 to 18 teeth. Length, 460 mm. The *nasals* are remarkably elongate, 470 mm. (No. 666), and gradually increase in breadth posteriorly; in No. 666 they are continuous back to the frontals; in No. 600 there is a fracture or suture above the preorbital fenestra which is not observed in No. 666, and, therefore, is apparently accidental. The *frontals* are extremely short, 140 mm. in No. 666, extending back to a point midway between the supra-temporal fossæ. The superior portion of the parietals is also abbreviate, but laterally and posteriorly they form two large transversely extended vertical plates constituting the crest or superior and lateral portions of the occiput. The narrow *supraoccipitals* apparently extend partly between the parietal crest above; below they are in contact with the conjoined exoccipitals. The *exoccipitals* unite in the median line above the foramen magnum and extend outward in two broad wing-like plates with which the paroccipitals are coalesced. The *basioccipital* alone enters into the prominently convex condyle.

The lateral portions of the occipital region are formed by the posterior plates of the *squamosals*, which fill the bordering angle between the parietals and paroccipitals; in side view the squamosals are indented by a spur of the postorbito-frontals, and send a descending process for articulation with the ascending process of the quadratojugals. The *quadrates* are vertically extended with a singly convex head above for a jointed articulation with the squamosals, and a doubly convex transversely extended distal extremity for union with the articulares. The *quadratojugals* are placed on the outer sides of the quadrates, and are shorter elements than the jugals. The *jugals* are triradiate bones articulating with the quadratojugals, postorbito-frontals, and prefronto-lachrymals, respectively. The elements bounding the orbits anteriorly, uniting with the jugals and maxillaries below and with the nasals and

¹ This matter has been carefully discussed by S. W. Williston: 'The Dinosaurian Genus *Creosaurus*, Marsh.' *Amer. Journ. Sci.*, Vol. XI, 1901, p. 111.

frontals above, are considered to represent a complex composed of the *prefrontals* and *lachrymals*; they are surmounted by a stout tuberos process which is deeply excavated on the antero-external surface; this process may have supported something in the nature of a low dermal horn.

Below the condyles the basioccipitals descend abruptly downward and backward; on each side of this downward projection are the apparently inferior plates of the exoccipitals. From these inferior plates two still more depressed wings extend downward, which probably represent antero-inferior processes of the basisphenoids for articulation with the pterygoids.

Lower jaw. — In the *lower jaw* the articulators, angulars, and dentaries are clearly determinable. The suture between the coronoid and angular is faintly determinable posteriorly, the coronoid being depressed. The convex element extending along the inner side of the dentary but firmly coalesced with it may represent a presplenial; if this is truly the presplenial it appears to extend as far forward as the symphysis. There are apparently sixteen alveoli for the laterally compressed lower teeth in the dentary.

A fuller description of these skulls will appear in a forthcoming memoir.

INDEX TO VOLUME XIX.

[New names of higher groups, genera, species, and subspecies are printed in heavy-faced type, as are also the main references in a series of references to species, etc.]

ACIDASPIS *whitfieldi*, 97.

*Acrogaster davis*i, 450.
heckeli, 450.

Acrognathus, 427.
boops, 427.
dodgei, 427, 449.
libanicus, 449.

Actinians, West Indian sponge-incrusting, 495-503.

Agnomius, 28.

Agriochoerus maximus, 200.

Alpichtys formosus, 445, 450.
minor, 450.
velifer, 450.

Alces americanus, 358.
gigas, 527.

Alcyonium serpens, 496, 498.

Allen, J. A., description of a new species of *Sigmodon* from Ecuador, 99, 100; report on the mammals collected in northeastern Siberia by the Jesup North Pacific Expedition, with itinerary and field notes by N. G. Buxton, 101-184; descriptions of new Rodents from southern Patagonia, with a note on the genus *Euneomys* Coues, and an addendum to article IV on Siberian Mammals, 185-196; mammals collected in Alaska and northern British Columbia by the Andrew J. Stone Expedition of 1902, 521-567; list of mammals collected by Mr. J. H. Batty in New Mexico and Durango, with descriptions of new species and subspecies, 587-612; a new Deer and a new Lynx from the State of Sinaloa, Mexico, 613-615.

Amphicyon, sp., 627.

Anergates, sp., 651.

Anguillavidae, 436.

Anguillavus, 437.

bathshebae, 439, 450.

quadripinnis, 437, 450.

Anisacodon, 229.

Anognmius, 20.

altus, 41.

aratus, 27, 34.

constrictus, 27, 28.

evolutus, 27, 46.

favirostris, 27, 30.

polymicrodus, 35.

Anthophilax hoffmanni, 518.

viridis, 519.

Antilocapra americana, 377.

Antilope cervicapra, 377.

Antrozous pallidus, 612.

Ants, gynandromorphous, 653-683.

Apes and monkeys, published cases of parietal division in, 242-254.

Aphelops fossiger, 634.

sp., 530.

Apis mellifica, 653.

Apternodus mediævus, 202, 199,

Arctomys, 183, 184, 381.

caligatus, 539.

empetra, 141.

monax, 141.

parryi, var. *β. erythroglutæa*, 534, 536.

parryi, var. *γ. phæognatha*, 538.

sp.? 144.

Arvicola drummondi, 549.

kamtschaticus, 145, 149.

rufocanus var. *kamtschaticus*, 145.

wosnessenskii, 146.

Ateles ater, 270, 292.

belzebub, 286.

sp., 307.

vellerosus, 286.

Azteca instabilis, 674.

BATHYGENYS alpha, 200, 220.

Bear, Black, 361, 562.

Grizzly, 562.

- Bear, Kadiak, 561.
 Kamchatka, 163.
 Sitka, 562.
 Bergia, 495-497.
 catenularis, 496.
 via lactea, 496, 498.
 Bergidæ, 495, 497.
 Beryx multidentatus, 46.
 Beutenmüller, William, notes
 on some species of *Catocala*,
 505-510; notes on some
 beetles from the Black
 Mountains, with descrip-
 tions of new species, 511-
 519; description of a new
 moth from North Carolina,
 585, 586; a new Katydid
 from Florida, 637, 638.
 Bighorn, Kamchatka, 130.
 Bison, 183.
 americanus, 378.
 Blastomeryx gemmifer, 634.
 Borophagus diversidens, 627.
 Bos grunniens, 378.
 indicus, 359, 379.
 taurus, 379.
 Boselaphus, sp., 259.
 tragocamelus, 378.
 Brown, Barnum, a new species
 of fossil Edentate from the
 Santa Cruz Formation of
 Patagonia, 453-457; a new
 genus of Ground Sloth from
 the Pleistocene of Ne-
 braska, 569-583.
 Bubalis swaynei, 378.
 Bulinus rhomboideus, 487.
 Bunælorus infelix, 199, 210.
 Buxton, N. G., see Allen, J. A.
- CÆNOPUS, 198, 200.
 Camelus, 379.
 Campeloma multilineata, 487.
 producta, 487.
 vetula, 487.
 Camponotus ligniperdus, 675.
 Canimartes cumminsii, 627.
 Canis familiaris, 183.
 impavidus, 609.
 latrans, 373.
 lupus, 166.
 lupus griseoalbus, 373.
 occidentalis, 525, 560.
 vigilis, 613.
 Capra angora, 374.
 Cariacus mexicanus, 593.
 Caribou, Osborn, 526.
- Cassiopella turricula, 487.
 Castor canadensis, 381.
 fiber, 381.
 Catocala aholibah var. **colora-**
 densis, 507.
 alabamæ, 508.
 amestris, 508.
 amica var. **suffusa**, 508.
 andromache, 510.
 aspasia, 505.
 aspasia var. augusta, 505.
 aspasia var. sara, 505.
 aspasia var. sierræ, 505.
 arizonæ, 506.
 augusta, 505.
 babayaga, 506.
 barnesii, 508.
 bianca, 505, 506.
 chiricahua, 507.
 herodias, 506.
 hippolyta, 510.
 innubens var. **flavidalis**,
 508.
 insolabilis, 509.
 jessica, 507.
 luciana, 507.
 luciana var. somnus, 507.
 olivia, 508.
 relicta, 505.
 relicta var. **clara**, 506.
 relicta var. elda, 506.
 relicta var. phrynna, 506.
 unijuga var. **fletcherii**, 509.
 verrilliana, 507.
 violenta, 507.
 Cebus albifrons, 282, 305.
 capucinus, 286, 291.
 fatuellus, 253.
 hypoleucus, 283, 306.
 sp., 269, 304.
 Cercopithecus, sp., 251-253.
 callitrichus, 295.
 campbelli, 252.
 fuliginosus, 318.
 patas, 252.
 Cervus, 183.
 axis, 376.
 canadensis, 376.
 dama, 376, 591.
 elaphus, 375.
 mexicanus, 593.
 virginianus, 376.
 Chalicoderma muraria, 655.
 Charitosomus hakelensis, 433,
 449.
 lineolatus, 449.
 major, 449.

Chickaree, Bailey, 532.
 Vancouver, 531.
 Chimpanzee, parietal division
 in, 243-249.
 Chipmunk, Gray-headed, 533.
 Chirocentrites libanicus, 415.
 Chirothrix lewisi, 449.
 libanicus, 449.
 Cimolichthys contracta, 82.
 gladiolus, 75.
 merrillii, 82.
 nepæolica, 82.
 semianiceps, 82, 83.
 sulcatus, 82, 83.
 Citellus, 183.
 barrowensis, 141.
 buxtoni, 102, 139, 183.
 columbianus, 537.
 columbianus *albertæ*, 537.
 erythrogluteus, 524, 534.
 eversmanni, 142.
 parryi, 141, 538.
 stejnegeri, 102, 142.
 stonei, xviii., 524, 537.
 variegatus, 597.
 (Otospermophilus) gram-
 murus, 588.
 (Otospermophilus) gram-
 murus *rupestris*, 595.
 Clupea attenuata, 414.
 Coassus armatus, 448.
 sp., 377.
 Coccodus *insignis*, 410, 448.
 lindstroemi, 409, 448.
 Corbicula subelliptica, 487.
 Corymbites longicornis, 518.
 Creccoides osbornii, 627.
 Creosaurusatrox, 697-701.
 Ctenomys, 185, 317.
 colburni, 188.
 microtis, 189.
 robustus, 185.
 sericeus, 187.
 Ctenothrissa ovalis, 448.
 signifer, 417, 448.
 vexillifer, 448.
 Cychnus *æneicollis*, 515.
 andrewsii, 514.
 canadensis, 516.
 guyoti, 513.
 stenostomus var. *bicarina-*
tus, 516.
 stenostomus var. *lecontei*,
 516.
 viduus var. *irregularis*,
 513.
 violaceus, 513.

Cyclobatis major, 447.
 oligodactylus, 447.
 Cyliodrodon fontis, 199, 212.
 Cynocephalus baboon, 264.
 mormon, 284.
 ursinus, 254, 351.
 Cynodictis, 198.
paterculus, 199, 209.
 Cynomys, sp., 381.
 Cyrtophilus *floridensis*, 637.

 DAMA, 591.
 Daptinus phlebotomus, 49.
 phlebotomum, 49.
 Deer, Musk, 129.
 Sitka, 528.
 Virginia, 474, 475.
 Delphinapterus leucas, 119-
 124.
 Dermoptychius, 423.
 Dibelodon humboldtii, 627.
 mirificus, 619, 627.
 præcursor, 627.
 tropicus, 627.
 Dicrostonyx, 183.
 hudsonius alascensis, 152.
 nelsoni, 152.
 torquatus, 151.
 Dinocyon gidleyi, 620, 634.
 Dinopteryx spinosus, 450.
 Dinotherium, 387, 388.
 Diplomystus birdi, 448.
 brevissimus, 448.
 Dorcelaphus hemionus, 317,
 375.
 Duerden, J. E., West Indian
 Sponge-incrusting Actin-
 ians, 495-503.

 ELEPHANT, significance of the
 shortening of the skull in
 the, 387-394.
 Elephas, 389-394.
 imperator, 618, 623, 624.
 primigenius, 623, 624.
 Elk, 129.
 Empo, 81.
 contracta, 82, 84.
 merrillii, 82, 83.
 nepæolica, 82.
 nepæolica, 81-89.
 semianiceps, 82.
 sulcata, 82.
 Encheliidæ, 441.
 Enchelon, 441.
 montium, 441, 450.

- Enchodus, 66.
 dolichus, 72.
 ferox, 68.
 gladiolus, 75.
 longidens, 422, 449, 450.
 major, 449.
 marchesettii (?), 421, 449.
 petrosus, 70.
 pressidens, 68.
 sævus, 76.
 tetrahus, 74.
 tetræchus, 74.
Epipheidole inquilina, 664.
 Equus caballus, 474, 475.
 complicatus, 623.
 cumminsi, 627.
 eurystelus, 630.
 excelsus, 623.
 major, 623.
 minutus, 627.
 scotti, 618, 620, 624.
 semiplicatus, 623.
 simplicidens, 627, 630.
 sp., 379.
 tau, 623.
Erethizon epizanthus nigrescens, 525, 558.
 Erichelurus syriacus, 449.
 Erignathus barbatus, 160.
 Erinaceidæ, 227.
 Erinaceinæ, 227.
 Erinaceus, 227, 229.
 europæus, 179.
 europæus (amurensis) 180.
 orientalis, 102, 179.
 sibiricus, 180.
 Erisichthe dimidiata, 16, 17.
 nitida, 3, 16.
 penetrans, 4, 5.
 ziphioides, 22.
 Ermine, 174.
Eubiodectes, 415.
 libanicus, 415, 448.
Eucinepelta complicatus, 453-457.
 petesatus, 453.
 Eumys elegans, 200.
 minor, 215.
 Euneomys, 185, 194.
 petersoni, 192.
 Eurygnathus marchesettii, 421.
 Eurypholis boissieri, 449.
 Eutamias, 183, 184.
 asiaticus, 137.
 bulleri, 595.
 caniceps, 524, 533.
 durangæ, 594.
 Eutamias senescens, 138.
 Evotomys, 183.
 alascensis, 547.
 dawsoni, 524, 546, 557.
 jochelsoni, 102, 148.
 wosnessenskii, 146.
 wrangeli, 524, 546.
 (Craseomys) **latastei**, 102, 145.
 Exocœtoides minor, 449.
FELIS canadensis, 371.
 catus, 371.
 concolor, 317, 370.
 domestica, 371.
 hillanus, 527.
 leo, 370.
 onca, 370.
 pardalis, 316, 371.
 tigris, 370.
 Fiber osoyoosensis, 552.
 spatulatus, 525, 551, 557.
 zibethicus, 381, 552.
 Formica ciliata, 639, 640-643.
 dakotensis, 639.
 exsecta, 669.
 microgyna, 639, 645, 656-658.
 microgyna var. **rasilis**, 648.
 oreas, 639, 643.
 rufescens, 670.
 rufibarbis, 669.
 sanguinea, 666.
 truncicola, 670.
 Formicoxenus, sp., 651.
 Fox, Arctic, 171.
 Black or Silver Gray, 170.
 Blue, 172.
 Cross, 170.
 Fir, 561.
 Red, 170.
 Siberian Red, 167.
GALERIX, 227, 229.
 Gemmaria swiftii, 501.
 Gibbons, parietal division in, 250.
 Gidley, J. W., a new Three-toed Horse, 465-476; on two species of *Platygonus* from the Pliocene of Texas, 477-481; the Fresh-water Tertiary of northwestern Texas. American Museum Expeditions of 1899-1901, 617-635.

- Gillicus, 59.
 serridens, 59.
 Glossotherium, 570, 571.
 Glyptodon petaliferus, 491.
 septentrionalis, 491.
Glyptotherium texanum, 492-494, 619, 627.
 Gorilla, parietal division in, 249.
 Gregory, W. K., adaptive significance of the shortening of the Elephant's skull, 387-394.
 Grypotherium, 570, 571.
 Gulo gulo, 172.
 luscus, 524, 564.
 Gymnoptychus, 201.
 minimus, 199, 216.
 minor, 199, 215.
 Gymnura, 227, 229.

 HALEC microlepis, 448.
 Haiycites **radiatus**, 490.
 sp., 489.
 Hapale, sp., 270.
 Hare, Chukche, 159.
 Gichiga, 155.
 Lake Bennett, 559.
 Hay, O. P., on genera and species of North American Cretaceous Actinopteros Fishes, 1-95; on a collection of Upper Cretaceous Fishes from Mount Lebanon, Syria, with descriptions of four new genera and nineteen new species, 395-452.
 Hemipsalodon, 201.
 Heptranchias gracilis, 447.
 Hesperomys leucopus arcticus, 540.
 Hipparion, 465, 466, 630.
 lenticularis, 634.
 occidentalis, 634.
 sp., 634.
 Hippotherium affine, 634.
 occidentale, 634.
 Histiothrissa crassipinna, 448.
 Histiophoca fasciata, 103, 161.
 Hitchcock, C. H., notice of a new species of *Acidaspis* from a boulder of Marcellus shale, found in drift, at West Bloomfield, New Jersey, 97, 98.
 Holcolepis, 28.
 attenuatus, 414, 448, 450.
 Holcolepis gracilis, 448.
 leroisii, 448.
 sardinoides, 448.
 Holomeniscus macrocephalus, 623.
 sulcatus, 623.
 Hoplopteryx lewisi, 450.
 oblongus, 450.
 stacheyi, 450.
 syriacus, 450.
 Hrdlicka, Ales, divisions of the parietal bone in man and other mammals, 231-286.
 Hyæna maculata, 372.
 Hyænodon, 201.
 minutus, 208.
 Hylobates concolor, 250, 351.
 Hylomys, 227, 229.
 Hypertragulus, 201.
 Hyppidium interpolatum, 630.
 Hypsocormus, 3.
 tenuirostris, 3.
 Hyracodon, 200, 219.

 ICHTHYODECTES anaides, 54, 415.
 arcuatus, 59.
 goodeanus, 52.
 multidentatus, 57.
 perniciosus, 9.
 serridens, 59.
 Ichthyotringa tenuirostris, 94.
 Ictops, 227.
 acutidens, 199, 205.
 bullatus, 205.
 dakotensis, 205.
 thompsoni, 199, 207.
 Ischyromys **veterior**, 199, 211.
 Istieus lebanonensis, 448.

 KATYDID, new, from Florida, 637.
 Killer, 125.

 LAGIDIUM, 317.
 Lamna sulcata, 397.
 Lanthanotherium, 227, 229.
 Lasius latipes, 650.
 niger var. americanus, 675.
 niger var. neoniger, 650, 651.
 Lemming, Golden, 153, 556.
 Pied, 151.
 Lemmus, 183.
 helvolus, 525, 556.
 obensis **chrysogaster**, 102, 153.

- Lemmus trimucronatus*, 152.
Leptictidæ, 227.
Leptictis, 227.
 haydeni, 205.
Leptochoerus *quadricuspis*,
 220.
Leptomeryx, 198, 201.
 esulcatus, 200, 222.
 mammifer, 200, 224.
Leptosomus, 91.
 lineatus, 92.
 macrurus, 449.
 minimus, 449.
 nasutulus, 91.
 percrassus, 92.
Leptothorax emersoni, 651.
 obturator, 662.
 tuberum, 672.
Leptotrachelus, 89.
 armatus, 89.
 gracilis, 449.
 hakelensis, 449.
 longipinnis, 90.
 serpentinus, 419, 449.
 triqueter, 449.
 virgulatus, 89.
Leptotragulus, 201.
 profectus, 200, 224.
Lepus, 183.
 campestris, 381.
 canescens, 157.
 gaillardi, 607.
 gichiganus, 102, 155.
 insolitus, 613.
 saliens, 525, 559.
 texianus eremicus, 590.
 timidus var. tschuktscho-
 rum, 157.
 tschuktschorum, 159.
 (*Macrotolagus*) *gaillardi*
 battyi, 607.
 (*Macrotolagus*) *texianus*
 griseus, 589, 606.
 (*Macrotolagus*) *texianus*
 micropus, 605.
 (*Sylvilagus*) *arizonæ ma-*
 ior, 608.
 (*Sylvilagus*) *arizonæ minor*,
 590, 608.
 (*Sylvilagus*) *durangæ*, 609.
Lestodon, 570, 571.
 armatus, 570.
 myloides, 570.
Limnetes, sp., 200, 201, 222.
Liomys canus, 605.
Lynx ruffus escuinapæ, 614.
 ruffus texensis, 590.
- MACACUS cynomolgus*, 251, 268.
 erythraeus, 269, 285.
 rhesus, 264-268, 271-281,
 284, 285, 287-291, 297-
 304.
 sp., 281.
Machærodus sp., 634.
Mærittherium, 387.
Man, published cases of parie-
 tal divisions in, 234-242;
 new cases, do., 254-264.
Marmot, *Hairy*, 539.
 Parry, 141.
 Quebec, 141.
 Siberian, 144.
Marmotta caligata, 539.
Mastodon, 387, 388.
 americanus, 388.
 productus, 617, 620, 634.
 sp., 634.
 (*Trilophodon*) *euhypodon*,
 387.
 (*Trilophodon*) *productus*,
 389.
Matthew, W. D., the Fauna of
 the Titanotherium Beds at
 Pipestone Springs, Mon-
 tana, 197-226; a fossil
 Hedgehog from the Ameri-
 can Oligocene, 227-229.
Megalonyx leptostoma, 627.
 sp., 627.
Mephitis estor, 611.
 macroura milleri, 611.
Merychippus mirabilis, 634.
Merycochærus, sp., 634.
Mesiteia sahel-almæ, 447.
Mesodectes, 227, 229.
Mesohippus, 198.
 bairdii, 200, 474, 475.
 westoni, 200, 218.
Michthysoma heterodoxum,
 519.
Microcælia dayi, 430, 449.
 libanica, 449.
Micropternodus borealis, 199,
 204.
Microtus, 183, 184.
 cautus, 548.
 drummondi, 524, 549, 557.
 kamtschaticus, 149.
 macrurus, 524, 551.
 mordax, 549.
 mordax vellerosus, 524,
 548.
 stonei, 550.
 vellerosus, 548, 557.

- Monkeys, published cases of
parietal division in, 250-
253; new cases, do., 264-
315.
- Moose, Alaska, 527.
- Moschus moschiferus*, 129.
sibericus, 129.
- Mouse, Arctic White-footed,
540.
Bangs White-footed, 544.
Dawson Red-backed, 546.
House, 540.
Kamchatka Red-backed,
145.
Kolyma Red-backed, 148.
Sitka White-footed, 540.
Stickine Jumping, 558.
Wosnessenski Red-backed,
146.
Wrangel Red-backed, 546.
- Mus alexandrinus*, 598.
empetra, 141.
musculus, 524, 540, 557,
598.
rattus, 598.
volans, 132, 133.
- Muskrat, Northwest, 551.
- Mustela? calotus*, 134.
zibellina, 173.
- Mycetes seniculus*, 252, 254,
351.
- Mylodon*, 570, 571.
armatus, 570.
darwini, 570.
gracilis, 570.
harlani, 570, 571.
littsomi, 570.
robustus, 570, 571.
sp., 627.
- Myodes schisticolor*, 153, 154.
- Myotis californicus durangæ*,
612.
incautus, 611.
lucifugus, 567.
- Myrmica caldaria*, 668.
lævinodis, 653, 672, 673.
lobicornis, 668.
ruginodis, 668.
scabrinodis, 673.
- NECROGYMNURUS, 227, 229.
- Nematonotus hottæ*, 428, 449.
longispinus, 428, 449.
- Neohipparion whitneyi*, 465-
476.
sp., 627.
- Neomyiodon*, 570.
- Neotoma mexicana*, 381, 589.
cinerea saxamans, 524, 544.
intermedia durangæ, 602.
saxamans, 544, 557.
- Nomaretus debilis* var. *alpinus*,
512.
hubbardii, 512.
imperfectus, 512.
- Nyctinomus mohavensis*, 612,
Nylghai, 378.
- OCHOTONA, 183.
kalymensis, 102, 154.
- Odocoileus battyi*, 591.
columbianus sitkensis, 524,
528.
couesi, 593.
sinaloæ, 613.
- Olene montana*, 585.
- Onychomys torridus*, 598.
- Opisthopteryx gracilis*, 449.
- Orang, parietal division in,
242, 249.
- Orca rectipinna*, 125.
- Oreamnos montanus*, 524, 531.
- Oreodon*, 201.
- Oricardinus sheareri*, 64.
tortus, 65.
- Orinidæ, 497.
- Ornitholestes hermanni*, 459-
464.
- Orosoma intermedium*, 450.
pulchellum, 450.
sahal-almæ, 450.
- Oryx*, 378.
- Osborn, Henry Fairfield, *Ornitholestes hermanni*, a new Compsognathoid Dinosaur from the Upper Jurassic, 459-464; *Glyptotherium texanum*, a new Glyptodont from the Lower Pleistocene of Texas, 491-494.
- Osmeroides*, 28, 423.
attenuatus, 414.
evolutus, 46.
favirostris, 30.
megapterus, 449.
ornatus, 426, 449.
pontivagus, 424, 449.
pusillus, 449.
woodwardii, 449.
- Otodus latus*, 447.
sulcatus, 397, 447.
- Otter, 178.
- Ovibos, 183.

- Ovis*, 183.
 aries, 374.
 borealis, 196.
 canadensis liardensis, 530.
 montana, 374.
 musimon, 374.
 nivicola, 130, 184, 196.
 stonei, 374, 524, 530.
 tragelaphus, 474.
Oxymycterus microtis, 189.
- PACHYRHIZODUS*, 27, 59.
 caninus, 60.
 curvatus, 60.
 latimentum, 60.
 lepitopsis, 64.
 leptopsis, 64.
 sheareri, 64.
 sheari, 64.
- Palæictops*, 227, 229.
Palæobalistum gœdeli, 448.
Palæoërinaceus, 227, 229.
Palæolagus, 198.
 agapetalus, 218.
 brachyodon, 200, 217, 218.
 haydeni, 200, 218.
 intermedius, 218.
 temnodon, 200, 216, 218.
 triplex, 217.
 turgidus, 202, 217, 218.
- Pantopholis dorsalis*, 449.
Paralces, 183.
 alces, 129.
 gigas, 524, 527.
- Paramylodon*, 569.
 nebrascensis, 571-583.
- Parazoanthus*, 496.
 catenularis, 496-499.
 monostichus, 496, 498.
 parasiticus, 500.
 separatus, 500.
 swiftii, 501.
- Parietal division in man and other mammals, 231-286;
 in man, 234-242; in apes and monkeys, 242-315; in mammals lower than monkeys, 315; pathological and accidental, 317; the causes of anomalous, 319-347; résumé as to causation in man, 331; morphological value of, 332-335; determining causes of, 341-347; partial, due to the manner of ossification, 350-361; wormian or fontanel bones in parietal sutures and fissures, 361-363; partial divisions, due to mechanical obstruction, 363-381; bibliography of the subject, 382-386.
- Passalacodon*, 229.
Pelecopterus chirurgus, 4, 8.
 gladius, 24.
 perniciosus, 14.
- Peratherium titanelix*, 199, 202.
Perodipus obscurus, 603.
Perognathus flavus, 604.
 nelsoni, 604.
- Peromyscus arcticus*, 524, 540, 557.
 boylii pinalis, 600.
 oreas, 524, 544, 557.
 paulus, 598.
 sitkensis, 524, 540.
 texanus flaccidus, 599.
 tornillo, 588.
- Petalopteryx dorsalis*, 448.
 syriacus, 448.
- Phasganodus?* *gladiolus*, 75.
Pheidole ceres (nom. nud.), 666.
 pilifera var. *coloradensis*, 666.
- Phenacomys constablei*, 525, 553, 557.
- Phoca foetida*, 317, 381.
 groenlandica, 103, 381.
 hispida gichigensis, 102, 161.
 ochotensis, 162.
 ochotensis macrodens, 163.
 richardii, 103.
 richardii pribilofensis, 524, 560.
 vitulina, 381.
- Pika*, *Kolyma*, 154.
- Platygonus bicalcaratus*, 477, 627.
 sp. ind., 624.
 texanus, 478-481, 621, 627.
- Platynus gracilentus*, 517.
 trifoveolatus, 516.
- Plethodus*, 28.
- Pliauchania spatula*, 627.
 sp., 627, 634.
- Pliohippus simplicidens*, 627.
 sp., 634.
- Poëbrotherium*, 200, 201.
- Polyergus rufescens*, 670, 671.
 rufescens var. *lucidus*, 659.
- Polythoa axinellæ*, 501.
 swiftii, 501.

- Ponera punctatissima*, 653.
Porcupine, Dusky, 558.
Portheus arcuatus, 55, 59.
 gladius, 24.
Prionolepis cataphractus, 449.
 laniatus, 449.
Procamelus gracilis, 634.
 leptognathus, 634.
 robustus, 634.
 sp., 634.
Procyon lotor hernandezii, 611.
Pronotacanthus sahel-almæ,
 449.
Proterix loomisi, 228
 fossulatus, 634.
Protohippus lenticularis, 630.
 mirabilis, 634.
 parvulus, 634.
 perditus, 630, 634.
 placidus, 634.
 sp., 627, 630.
Protoptychus, 201.
Protosphyraena, 2.
 chirurgus, 4.
 dimidiata, 2, 16.
 gladius, 24.
 nitida, 3, 16, 20.
 obliquidens, 4, 7.
 penetrans, 4, 6, 14.
 perniciosa, 9.
 sequax, 20.
 tenuis, 13, 14.
 ziphioides, 22.
Pseudoberyx bottæ, 448.
 grandis, 448.
 longispina, 428.
 syriacus, 448.
Pseudolestodon, 570, 571.
Pseudopteronodon minutus, 199,
 208.
Pseudothryptodus, 28.
Pteromys russicus, 132, 134.
 sibiricus, 132.
Putorius cognanii richard-
 soni, 525, 562.
 microtis, 525, 563.
 (Arctogale) ermineus, 174.
 (Arctogale) pygmæus, 102,
 176, 183.
 (Arctogale) richardsonii,
 175.
 (Arctogale) rixosus eskimo,
 178.
Pyncosterinx discoides, 450.
 dubius, 450.
 elongatus, 450.
 gracilis, 450.
Pyncosterinx latus, 450.
 levispinosus, 444, 450.
RAJA expansa, 406, 447.
 minor, 447.
 primarmata, 406, 447.
 whitfieldi, 405, 447.
Rangifer, 183.
 groenlandicus, 375.
 osborni, 524, 526.
 tarandus, 125-128, 375.
Rat, Northern Bushy-tailed,
 544.
Reindeer, 125-128.
Reithrodon, 185.
 chinchilloides, 194.
 cuniculoides, 194.
 cuniculoides obscurus, 190.
 hatcheri, 191.
 typicus, 194, 195.
Reithrodontomys megalotis
 sestiniensis, 602.
Rhinellus, 94.
 damoni, 95, 449.
 delicatus, 432, 449.
 ferox, 95, 449.
 furcatus, 95, 449.
 tenuirostris, 94.
Rhinobatus eretes, 404, 447.
 intermedius, 447.
 latus, 447.
 maronita, 447.
 tenuirostris, 447.
SABLE, 173.
Sardinioides, 423.
Sardinius imbellis, 93.
 lineatus, 92.
 percrassus, 92.
Saurocephalus, 48.
 arapahovius, 51.
 arapalovius, 51.
 goodeanus, 52.
 lanciformis, 50.
 phlebotomus, 49.
 xiphirostris, 51.
Saurodon, 48.
 lanciformis, 48, 50.
 leanus, 48.
 phlebotomus, 49, 51.
 xiphirostris, 51.
Sciuropterus, 183.
 russicus, 132.
 sp., 531.
 volans, 133.
Sciurus, 183.
 apache, 594.

- Sciurus calotus*, 134.
 hudsonicus, 381.
 hudsonicus baileyi, 524.
 hudsonicus vancouverensis, 524.
 jeffersoni, 200.
 striatus, 137.
 striatus α *asiaticus*, 137.
 variegatus, 597.
 vetustus, 199.
 volans, 132, 133.
 vulgaris argenteus, 134.
 vulgaris calotus, 134.
 vulgaris varius, 134.
 (*Prosciurus*) *vetustus*, 213.
 (*Tamiasciurus*) *hudsonicus baileyi*, 532.
 (*Tamiasciurus*) *hudsonicus vancouverensis*, 531.
Sclerorhynchus, 398.
 hiram, 401.
 sentus, 402.
 solomonis, 399.
Scombroclupea gaudryi, 448.
 macrophthalma, 448.
Seal, Bearded, 160.
 Okhotsk, 162.
 Okhotsk Ringed, 161.
 Pribilof Harbor, 560.
 Ribbon, 161.
Semnopithecus, sp., 250.
 silenus, 253.
Sheep, Stone, 530.
Shrew, Alaska Water, 567.
 Buxton, 181.
 Long-tailed, 566.
 Masked, 564.
 Mountain, 565.
 Saddle-backed, 566.
 Streator, 565.
Sigmodon arizonæ, 602.
 arizonæ major, 602.
 baileyi, 601.
 hispidus arizonæ, 601.
 hispidus major, 601.
 minimus, 600.
 puna, 99.
Simia silenus, 250, 253.
Sorex buxtoni, 102, 181.
 longicaudata, 524, 566.
 navigator alaskanus, 567.
 obscurus, 525, 565.
 obscurus longicaudata, 566.
 palustris alaskanus, 525.
 personatus, 525, 564.
 personatus streatori, 524, 565.
Sorex richardsoni, 566.
 (*Neosorex*) *palustris alaskanus*, 567.
Spaniodon blondeli, 448.
 elongatus, 448.
 hakelensis, 433.
 latus, 47, 448.
 sinus, 47, 88.
Spathiurus dorsalis, 448.
Spermophile, East Siberian, 139.
Spermophilus brunniceps, 142.
 buccatus, 597.
 empetra plesius, 536.
 macrourus, 597.
 parryi, 141, 142.
Sphyræna, 68.
Squirrel, Flying, 531.
 Pallas Ground, 137.
 Red-thighed Ground, 534.
 Siberian, 134.
 Siberian Flying, 132.
 Wrangel Ground, 537.
Stenamma westwoodi, 674.
 (*Aphænogaster*) *tennesseense*, 650.
 (*Aphænogaster*) *fulvum* subsp. *aquia* var. *picceum*, 659-662.
Steneofiber, 198.
Stenoprotome, 407.
 hamata, 407, 448.
Stibarus montanus, 200, 219.
 obtusilobus, 219.
Stratodus oxypogon, 80.
Sus scrofa, 379.
Synaptomys (*Mictomys*) *andersoni*, 525, 554, 557.
 (*Mictomys*) *chapmani*, 555.
Syntegmodus, 28, 29.
 altus, 29, 41.

TAMIAS orientalis, 138.
Tarpon, 12.
 atlanticus, 13.
Teleoceras, sp., 634.
Telepholis? *tenuis*, 449.
Tertiary, Fresh-water, of northwestern Texas, 617-635.
Testudo campester, 627.
 hexagonata, 623.
 laticaudata, 623.
 pertenuis, 627.
 turgida, 627.
Tetheodus pepero, 70.
 pepredo, 70.

Tetrabelodon serridens, 634.
 Tetracus, 227, 229.
 Tetramorium simillimum, 667.
 Tetrogmus caldarius, 667.
 Thaumastus limnæiformis, 487.
 Thomomys sinaloæ, 603.
 sp., 603.
 Thrissopteroides pulcher, 448.
 tenuiceps, 448.
 Thryptodus, 28.
 zitteli, 38.
 Trechus carolinæ, 516.
 Trienaspis, 89.
 virgulatus, 89.
 Triceratops serratus, 685-695.
 Titanotherium, 200.
 UNIO æsopiformis, 483.
 aldrichi, 487.
 browni, 485.
 cryptorhynchus, 487.
 danæ, 487.
 holmesiana, 487.
 percorrugata, 486.
 postbiplicata, 487.
 retusoides, 485.
 verrucosiformis, 484.
 vetusta, 487.
 Urenchelys, 434.
 avus, 449.
 germanus, 434, 449.
 hakelensis, 449.
 Ursus americanus, 369, 525,
 561.
 arctus var. beringiana, 164.
 beringianus, 163.
 horribilis, 525, 561.
 maritimus, 369.
 merriami, 521.
 middendorffi, 524, 561.
 sitkensis, 524, 561.

VESPERTILIO fuscus, 612.
 Vivipara plicapressa, 487.
 Vole, Anderson Lemming, 554.
 Chapman Lemming, 555.

Vole, Constable, 553.
 Drummond, 549.
 Kamchatka, 149.
 Olympic, 551.
 Woolly, 548.
 Vulpes alascensis abietorum,
 525, 561.
 anadyrensis, 102, 167.
 fulvus, 372.
 lagopus, 171, 195, 373.

WEASEL, Pigmy, 176.
 Richardson, 562.
 Small-eared, 563.
 Whale, Finback, 125.
 Humpback, 125.
 Right, 125.
 White, 119-124.

Wheeler, William Morton, ex-
 traordinary females in three
 species of *Formica*, with
 remarks on mutation in the
Formicidæ, 639-651; some
 new gynandromorphous
 Ants, with a review of the
 previously recorded cases,
 653-683.

Whitfield, R. P., notice of six
 new species of *Unios* from
 the Laramie Group, 483-
 487; observation on a re-
 markable specimen of *Haly-*
sites and description of a
 new species of the genus,
 489-490. See also Hay, O.
 P., p. 395.

Wolf, Gray, 166, 560.
 Wolverine, 172, 564.

XENOPHOLIS carinatus, 448.

ZALOPHUS californianus, 381.
 Zapus saltator, 525, 558.
 Zoanthacea, 497.
 Zoanthidæ, 497.
 Zoanthus parasiticus, 500.

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PAPERS PUBLISHED
IN THE
BULLETIN AND MEMOIRS
OF THE
AMERICAN MUSEUM OF NATURAL
HISTORY.

(BULLETIN, VOLUMES I-XVI, 1881-
1902; MEMOIRS, 1893-1902.)

NEW YORK:
PUBLISHED BY THE MUSEUM.

1902.

CONTENTS.

	PAGE
GEOLOGICAL DEPARTMENT	5
RECENT VERTEBRATES	9
FOSSIL VERTEBRATES	20
ENTOMOLOGY	24
ANTHROPOLOGY	27
MEMOIRS	29
BULLETIN	31
MUSEUM JOURNAL	31
MEMOIRS IN PREPARATION	32

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*Volume I.*¹

These papers are mainly preliminary reports on Fossil Vertebrates, chiefly collected by field parties of the Department of Vertebrate Palæontology under the direction of Henry Fairfield Osborn, Curator. Separates of these papers can be obtained of the Librarian of the Museum at the prices indicated, or in exchange.

1. Fossil Mammals of the Wahsatch and Wind River Beds. Collection of 1891. By Henry Fairfield Osborn and J. L. Wortman. Vol. IV, No. 1, Article xi, pp. 81-147, pl. iv, and 19 text figures. October 20, 1892. Price, 80 cents.
2. Revision of the Species of *Coryphodon*. By Charles Earle. Vol. IV, No. 1, Article xii, pp. 149-166, 2 text figures. October 18, 1892. Price, 15 cents.
3. Characters of *Protoceras* (Marsh), the New Artiodactyl from the Lower Miocene. By Henry Fairfield Osborn and J. L. Wortman. Vol. IV, No. 1, Article xviii, pp. 351-371, 6 text figures. December 30, 1892. Price, 25 cents.
4. *Artionyx*, a New Genus of Ancylopoda. By Henry Fairfield Osborn and Jacob L. Wortman. Vol. V, Article i, pp. 1-18, 5 text figures. February, 1893. Price, 20 cents.
5. *Aceratherium tridactylum* from the Lower Miocene of Dakota. By Henry Fairfield Osborn. Vol. V, Article vii, pp. 85-86. April 29, 1893. Price, 15 cents.
6. On the Divisions of the White River or Lower Miocene of Dakota. By J. L. Wortman, M.D. Vol. V, Article ix, pp. 95-105. June 27, 1893. Price, 15 cents.
7. Ancestors of the Tapir from the Lower Miocene of Dakota. By J. L. Wortman and Charles Earle. Vol. V, Article xi, pp. 159-180, 7 text figures. August 18, 1893. Price, 25 cents.
8. Fossil Mammals of the Upper Cretaceous Beds. By Henry Fairfield Osborn. Vol. V, Article xvii, pp. 311-330, pls. vii and viii, and 4 text figures. December 15, 1893. Price, 40 cents.

¹ A limited number of copies are bound separately in book form, as they accumulate. Volume I, issued January, 1898, contains Nos. 1 to 21, and a 'List of Casts,' etc. The edition in this form, however, is exhausted.

9. Osteology of *Patriofelis*, a Middle Eocene Creodont. By J. L. Wortman, M.D. Vol. VI, Article v, pp. 129-164, pl. 1, and 5 text figures. May 24, 1894. Price, 40 cents.
10. Fossil Mammals of the Lower Miocene White River Beds. Collection of 1892. By Henry Fairfield Osborn and J. L. Wortman. Vol. VI, Article vi, pp. 199-228, pll. II and III, and 8 text figures. July 28, 1894. Price, 50 cents.
11. On the Affinities of *Leptarctus primus* of Leidy. By J. L. Wortman. Vol. VI, Article viii, pp. 229-231. July 30, 1894. Price, 15 cents.
12. Fossil Mammals of the Puerco Beds. Collection of 1892. By Henry Fairfield Osborn and Charles Earle. Vol. VII, Article i, pp. 1-70, 21 text figures. March 8, 1895. Price, 80 cents.
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14. On the Osteology of *Agriochærus*. By J. L. Wortman. Vol. VII, Article iv, pp. 145-178, pl. 1, and 24 text figures. June 17, 1895. Price, 60 cents.
15. Perissodactyls of the Lower Miocene White River Beds. By Henry Fairfield Osborn and J. L. Wortman. Vol. VII, Article xii, pp. 343-375, pll. VIII to XI, and 12 text figures. December 23, 1895. Price, 80 cents.
16. Species of *Hyracotherium* and Allied Perissodactyls from the Wahsatch and Wind River Beds of North America. By J. L. Wortman. Vol. VIII, Article vi, pp. 81-110, pl. II, and 18 text figures. May 12, 1896. Price, 50 cents.
17. The Cranial Evolution of Titanotherium. By Henry Fairfield Osborn. Vol. VIII, Article ix, pp. 157-197, pll. III and IV, and 13 text figures. July 31, 1896. Price, 75 cents.
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19. The Ganodonts and their Relationship to the Edentata. By J. L. Wortman. Vol. IX, Article vi, pp. 59-110, and 36 text figures. March 22, 1897. Price, 85 cents.
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List of Casts, Models, Photographs of Skeletons and of Restorations, issued March 15, 1898. Price, 40 cents.

Volume II.

22. A Complete Skeleton of *Teleoceras fossiger*. Notes upon the Growth and Sexual Characters of this Species. By Henry Fairfield Osborn. Vol. X, Article iv, pp. 51-59, pll. iv, iva. March 18, 1898. Price, 25 cents.
23. A Complete Skeleton of *Coryphodon radians*. Notes upon the Locomotion of this Animal. By Henry Fairfield Osborn. Vol. X, Article vi, pp. 81-91, pl. x, and 2 text figures. April 4, 1898. Price, 20 cents.
24. The Extinct Camelidæ of North America and some Associated Forms. By J. L. Wortman, M.D. Vol. X, Article vii, pp. 93-142, pl. xi, and 23 text figures. April 9, 1898. Price, 70 cents.
25. Remounted Skeleton of *Phenacodus primævus*. Comparison with *Euprotogonia*. By Henry Fairfield Osborn. Vol. X, Article ix, pp. 159-164, pl. xii, and 4 text figures. May 6, 1898. Price, 20 cents.
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30. Restoration of *Oxyæna lupina* Cope, with Descriptions of Certain New Species of Eocene Creodonts. By J. L. Wortman. Vol. XII, Article vii, pp. 139-148, pl. vii, and 3 text figures. June 21, 1899. Price, 20 cents.
31. Fore and Hind Limbs of Carnivorous and Herbivorous Dinosaurs from the Jurassic of Wyoming. Dinosaur Contributions, No. 3. By Henry Fairfield Osborn. Vol. XII, Article xi, pp. 161-172, 8 text figures. October 30, 1899. Price, 25 cents.
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33. Phylogeny of the Rhinoceroses of Europe. Rhinoceros Contributions No. 5. By Henry Fairfield Osborn. Vol. XIII, Article xix, pp. 229-267, and 16 text figures. December 11, 1900. Price, 50 cents.

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2. The Temple of Tepoztlan, Mexico. By M. H. Saville. Vol. VIII, Article xi, pp. 221-226, pll. v-ix. Price, 50 cents.
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