

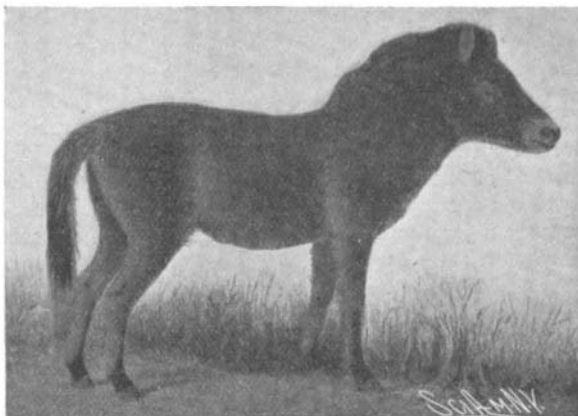
where he springs from the wheel. When he reaches the mark on the pathway he reverses his wheel instantly, and by a supreme effort he raises himself over the handle bars and hurls himself forward to the pool, never taking his eyes off the little flag. His dive really begins from the pedals and handle bars of his machine. He sails through the air, his body twisted and temporarily deformed, he swings himself around and gracefully descends into the tank amid the applause of thousands. The wheel drops near the tank and is usually caught by men with a rope. The sensation from the time the dive actually begins is beyond description. He laughs and sometimes talks to the men while in midair, although as we are dealing with minute fractions of a second the word is liable to be chopped off rather suddenly. Mr. Schreyer will probably have very few followers, and they can rest assured that in New York at least the police look askance at such dangerous feats. Mr. Schreyer often carries a bucket of red fire and the effect is weird in the extreme. His present weight is 148½ pounds; the bicycle weighs 24½ pounds, and the average length of the entire trip is 3½ seconds. Perhaps some of our mathematical readers will like to calculate the possible speeds at various points. The journey is made so quickly that the eye cannot see him leave the wheel. Few persons possess the requisite nerve and the marvelous rapidity of thought which it requires for an athletic act of this kind.

EVOLUTION OF THE HORSE.

BY WALTER L. BEASLEY.

Among the recent features prepared by the Paleontological Department of the American Museum of Natural History under the supervision of Prof. Henry F. Osborn, the curator, is a remarkable exhibit depicting the ancestry and evolution of the horse. The blue-ribbon high-stepper of to-day is authentically traced back three million years or more. At this remote time he was about the size of a fox, only sixteen inches high, having four and five toes, with which he scampered over the

skulls, numerous fore and hind limbs in perfect state of preservation, from which a complete skeleton has been constructed. These were found in a section known as the Niobrara beds in South Dakota. The difference between the skeleton restored from this find and the domestic horse of to-day is chiefly in proportions. The skeleton represents an animal with



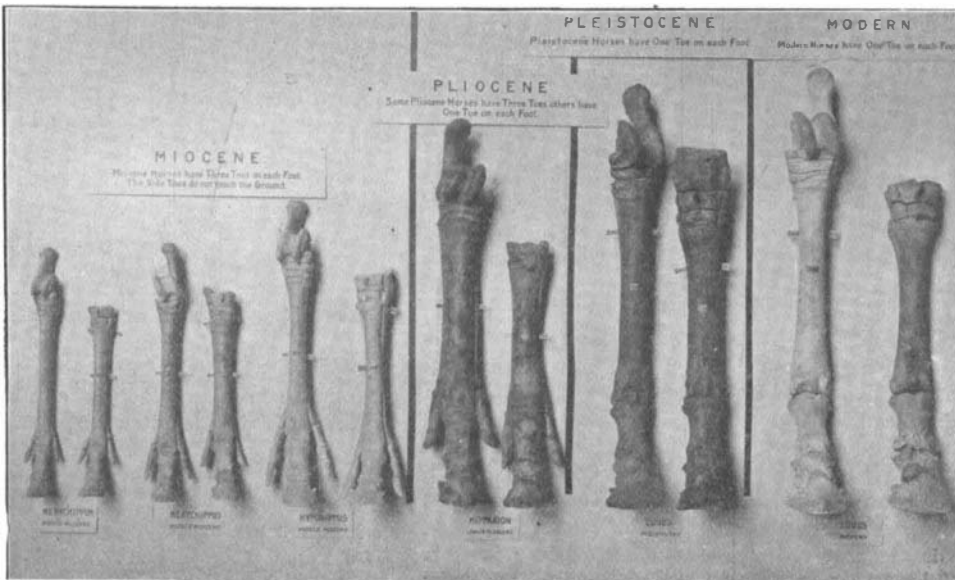
THE WILD HORSE OF ASIA. THE LAST LIVING ANCESTOR OF THE MODERN HORSE.

head about the size of a large draught-horse, but with the height of body and length of limb of an ordinary Western pony, and with a length of body very similar to that of the zebra. While extinct horse remains have been found in various parts of the world, the most complete and best-known series comes from the western part of our continent, which, during the Tertiary Period and Age of Mammals, was a great Lake Basin. After being drained

of the horse which once inhabited this Lake Region. The earliest recognized ancestor of the horse family is Eohippus, found in the Wasatch beds of Wyoming and New Mexico. He was about the size of a small fox, with four complete toes on the forefoot, and three on the hindfoot. He was fitted for swamps, and had simple, monkey-like teeth, and not at all like the complicated grinders of the horse of the present day. There is reason to believe that the still more remote ancestors of this and all other mammals had five toes on each foot, as in the forefoot of the earliest known stage is found a splint-bone, or small rudiment representing a missing digit or thumb. The accompanying illustration clearly shows the life history and origin of the horse in the various successive developments of the feet, and is arranged according to geological periods. Those found in the lowest strata of the Eocene Age, representing the earliest stage of evolution, are placed first, while the most recent ones, found in the uppermost strata of the Pleistocene, represent the final stage of evolution of the race, and are placed last. Viewing the specimens in the order of the age of the strata in which they were found, they show a regularly progressive change from the most ancient to the most recent times. In several of the first stages there are four complete toes on the fore, and three on the hindfoot. A new feature is observed in the Eohippus, that of the central toe of each foot is becoming much larger than the side toes. In the next descent an important stage is reached, that of the Oligocene, out of which was evolved Meshippus, the first three-toed horse. The middle toe is now much larger than the side toes, which bear very little of the weight of the animal, which is now about the size of a sheep. Miocene comes next in line with Hypo-



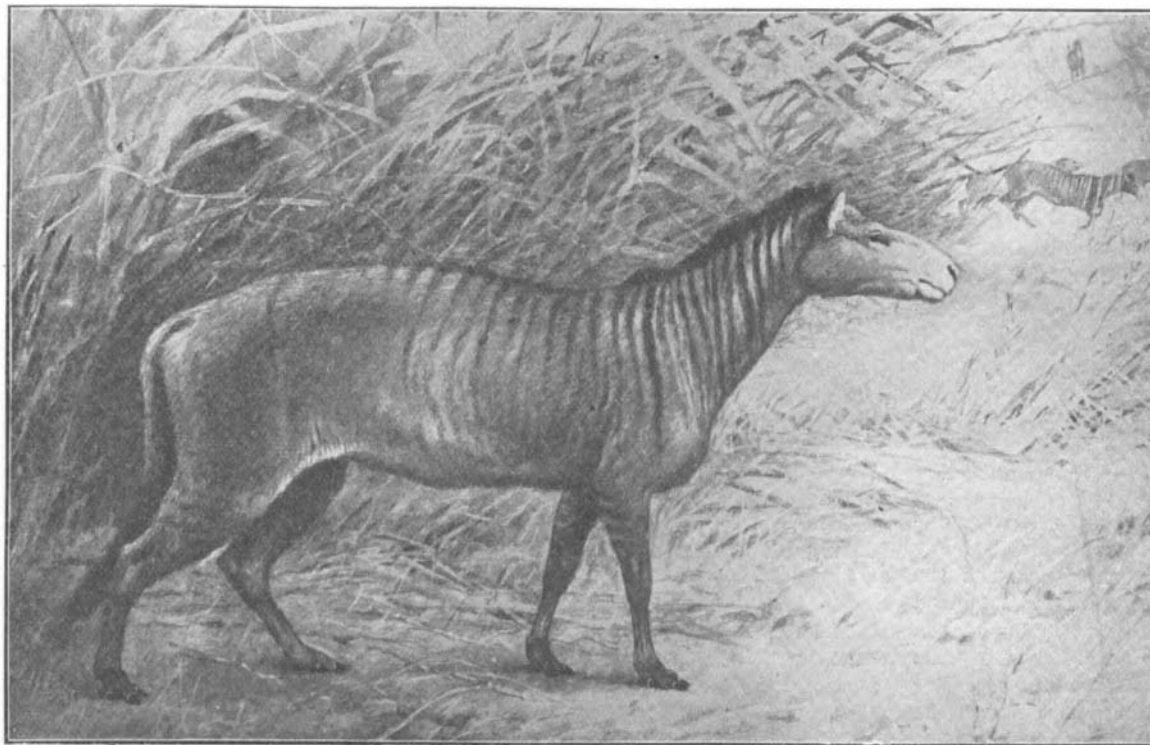
Development from Five Toes to Three Toes.



Development from the Miocene Three-toed Horse to the Modern One-toed Horse.

THE EVOLUTION OF THE MODERN SINGLE-TOED HORSE FROM THE PREHISTORIC FIVE-TOED HORSE.

marshes and shores of primeval earth. This noteworthy exhibit, the only one of its kind in America or elsewhere, is due to the Hon. William C. Whitney, through whose generosity a special expedition for the search of fossil horses was equipped and has been kept in the field for the past two seasons. The material gathered during this period, including some previously obtained by the Museum, together with a series of fine water-color paintings by Charles R. Knight, of wild asses, zebras, quaggas, etc., complete the display. The development of the horse is said to be one of the finest examples in existence illustrating the doctrine of evolution by means of natural selection and the adaptation of an animal to its peculiar environment. Several specially-trained and experienced investigators have carried on the field explorations, notably Mr. J. W. Gidley, who has made many successful finds of fossil horse remains on previous expeditions, and Mr. Barnum Brown. The crowning discovery of last season's expedition was made by Mr. Gidley near the end of a six weeks' search, when he uncovered the remains of a small herd of fossil three-toed horses, having



THE FIRST PRIMITIVE FOUR-TOED HORSE. SIXTEEN INCHES HIGH. FROM A PAINTING BY CHARLES R. KNIGHT.

off, this vast tract turned partly into an immense arid and desert region known to-day as the Bad Lands, or Equus Beds. The scattered remains of the skeletons are now found petrified and imbedded in the great sandstone and clay rock formations, which are gradually being worn away by the rain and the wind. Thus has been preserved a record of the successive species

hippus, equaling in size a Shetland pony. Hippohippus of the Pliocene time follows. This genus is much like Protohippus, but larger, and the feet are still three-toed. The climax stage of the evolution of the horse was evolved in the Pleistocene Age of Man. In this stage, that of the modern horse, the side toes have entirely disappeared, and are indicated by splints on the fore and hindfoot. No trace remains on the fore-foot of the little nodules which, in his diminutive ancestors, represented the fifth digit. The evolution of the horse, adapting it to live on the dry plains, is said to have gone hand in hand with the evolution of the plains themselves. At the commencement of the Age of Mammals, the western part of North America was not high above the sea-level. This low elevation would favor the growth of dense forests, to which condition of life the animals of the beginning of the Mammalian period must have adapted themselves. During the Tertiary period the continent was steadily rising above the ocean level, and becoming colder and drier. This change restricted and thinned the forests and brought about open grassy plains. The ancient forest animals

were forced either to retreat or disappear with the forests or to adapt themselves to the new order of existence, which the ancestors of the horse did. Along with the disappearance of the side-toes in the evolution of the horse there was a considerable increase in the proportionate length of limbs and feet, thereby giving the animal greater speed. The increase in length of limb rendered it necessary that the head and neck of a grazing animal should likewise become extended, in order to enable the mouth to reach the ground. The character of the teeth likewise underwent a marked change from short-crowned to long-crowned, thereby enabling the animal to feed on the hard and somewhat innutritious grasses on the dry plains, which required more thorough mastication than did the soft foodstuffs of the earlier ages. In the first part of the Quaternary period wild species of horse were found in every continent except Australia. For some unknown cause, all these horses became extinct in North and South America. The small, short-legged and shaggy-haired wild horse of Europe was contemporary with primitive man. The latest proof of this is the series of animal drawings and etchings recently found cut deep in the rock sides of the Combarelles Cave in France. Hitherto the small, big-headed horse found on bone and flint in other caves was supposed to be purely a food animal, and never used to carry men, but in the Combarelles drawings there is depicted another horse with small head, finer nose and delicate form. What is more important is the fact that some are shown with a halter or cord attached to the head, which goes far to prove that the Cave Men had domesticated and used the horse as a beast of burden, as well as for food. This justifies the conclusion that the men who were contemporary with the mammoth rode horses, and may have employed them in hunting with their weapons of stone and bone this great hairy beast, possibly some two million years ago. The wild horse at present is limited to the Old World, and is found only on the desert plains of Central Asia and Africa. Two specimens, male and female, of the little known Przewalsky's horse of Asia have just been received at the New York Zoological Gardens, having been captured by agents for Carl Hagenbeck in the Desert of Gobi. These are the nearest approach to the present horse of civilization, and supply an important link hitherto missing in the chain of evolution, which reaches down from the three-toed horse to the domestic animal of to-day. Prior to the discovery of the numerous fossil types of America, it was generally believed that the horse originated in Europe, especially as the Indian tribes first encountered by the white men on this continent had no horses. Modern paleontological research, however, such as is now being carried on by Prof. Osborn and Profs. Marsh and Cope in the past, has demonstrated that North America possesses a far more complete series of developmental stages, and points to the fact that the cradle of the modern horse lies probably not in Europe, but in the New World. The writer acknowledges his indebtedness to Prof. Henry F. Osborn for the privilege of reproducing photographs, and to Dr. W. D. Matthew, Associate Curator, for certain data incorporated in this article.

The Turkish Earthquake.

News comes from Turkey that a terrific earthquake occurred on April 29 at Melazgerd in the vilayet of Van, eighty miles southeast of Erzerum. It is said that the entire town was destroyed, together with its population of 2,000, among whom were 700 Armenians and the garrison. About 500 houses in the neighboring villages are said likewise to have been destroyed. The town lies 40 leagues to the southeast of Erzerum, the capital of the vilayet. It is about 110 miles distant in a northeasterly direction from Mount Ararat and 700 from Constantinople.

Eight great monoliths are ready for erection in building the Cathedral of St. John the Divine. The eight columns cost \$250,000. Over a year was wasted in a vain attempt to turn out the columns whole, and a special \$50,000 lathe was built for the purpose, which, after three monoliths had been broken, proved useless. The rough shafts measure 64 x 8½ x 7 feet, and weigh 310 tons each. Only one other structure, St. Isaac's Cathedral at St. Petersburg, has columns approaching these in size.

A London liveryman of the name of Alington has designed a new vehicle which he has placed on the streets of the great metropolis, with the idea of displacing the hansom, so long in favor despite its many acknowledged shortcomings. In many respects the carriage resembles the hansom, but the doors instead of opening on hinges are semicircular and move on rollers, sliding across the front from either side. This gives a great deal more room and permits of easier entrance and exit, and at the same times makes the carriage more compact. Another innovation is that it is supplied with a brake, which will be the means of preventing a number of accidents.

Austrian Prizes for Designs for Raising Canal-Boats.

In connection with the construction of the Danube-March-Oder Canal, a new problem of engineering presents itself for solution. It is how to raise and lower canalboats in crossing the watershed between Prerau (Moravia), the head of the March basin, and Altdorf, the head of the Oder basin. The elevation to be overcome is no less than 39.9 meters, or about 131 feet. It is, of course, desired to raise and lower the boats with the least possible consumption of water and at the smallest possible expense. The Austrian Minister of Commerce has offered prizes of 100,000, 75,000, and 50,000 crowns (\$20,300, \$15,225, and \$10,150) respectively for the three best designs to be submitted. The method of accomplishing the object is to be left entirely to the competitors, who are also at liberty to submit proposals for the construction of the works in accordance with their designs.

If the execution of the work is not intrusted to the person whose design is adopted, a premium of 200,000 crowns (\$40,600) will be given to him, in addition to the prize, when the successful operation of the contrivance has been demonstrated. Plans and drawings, together with a sealed envelope containing the name and address of the competitor, should be filed in the office of the Minister of Commerce not later than March 31, 1904. Any offer for constructing the works should be inclosed in the same envelope.

Copies of the minister's announcement, with full supplementary information for competitors, will be furnished gratis by the commissioner for the construction of waterways at Vienna and by the various provincial governors of the Empire; or in the United States, by the Austro-Hungarian embassy at Washington and the Austro-Hungarian consulates at New York, Philadelphia, Pittsburgh, Chicago, and San Francisco.

Official Awards of the Commercial Vehicle Test.

The Automobile Club of America has announced its awards in the commercial vehicle test held on May 20 and 21, 1903. In the first class, comprising vehicles carrying 750 pounds, a gold medal was awarded to the Mobile Company of America, Tarrytown, N. Y., for its steam delivery wagon. In the second class, comprising vehicles carrying 1,500 pounds, the Knox Automobile Company, of Springfield, Mass., was awarded gold and silver medals for the performance of its gasoline delivery wagons, and the International Motor Car Company, of Toledo, Ohio, was awarded a bronze medal for its Waverly electric delivery wagon. No award was made in the third class of vehicles to carry 3,500 pounds. In the fourth class, comprising vehicles carrying 6,000 pounds, a gold medal was awarded to the Morgan Motor Company, of Worcester, Mass., for a three-ton steam truck. In the fifth class, consisting of vehicles carrying 10,000 pounds, T. Coulthard & Co., of London, England, received a gold medal for their five-ton steam truck.

The Current Supplement.

An article on the new power house recently completed at Niagara Falls begins the current SUPPLEMENT, No. 1432. The discussion of the Serpollet steam automobile is continued. John David Rees concludes his entertaining account of domestic life in India. By far the most important article which appears in the current SUPPLEMENT is the paper read before the National Academy of Sciences by Prof. Alexander Graham Bell on his newly discovered tetrahedral principle in kite structure. The paper is published in full, together with the essential illustrations. Sir Oliver Lodge continues his admirable dissertation on electrons, discussing in the present installment the determination of the mass of an electron. A paper by Lieut.-Col. R. M. Holden, possessing no little scholarly interest, tells something of the formation and tactics of an Elizabethan army. An excellent narrative describing the explorations of Dr. Sven Hedin in Central Asia should be read with interest. The usual Trade Notes and Recipes, Suggestions from United States Consuls and Selected Formulæ will be found in their accustomed places.

Death of Rear Admiral Smith.

On May 28 Rear-Admiral David Smith, U. S. N., retired, died at Washington at the age of seventy-two. He entered the navy in 1859 as an engineer. His career was most brilliant. Throughout the entire civil war he served at sea with distinction. Despite the fact that he was retired for age in 1896 he applied for duty during the Spanish-American war.

The Ferris Wheel Sold.

The Ferris wheel, one of the attractions of the Chicago Exposition of 1893, was recently sold at public auction for \$1,800, engines, boilers, and all. Originally the contrivance cost \$362,000. It is said there are about \$300,000 worth of bonds outstanding against the owners of the wheel, as well as an indebtedness of \$100,000.



PETTY ECONOMY AT THE PATENT OFFICE.

If there is one department above any other of the government which can afford to conduct its financial operations on a generous and broad-minded scale, it is the Patent Office. Its business is enormous, averaging at the present something less than 800 patents, trademarks, etc., every week of the year, and it has a handsome surplus of over \$5,000,000 standing to its account in the Treasury. Yet, for some inscrutable reason the department is run on a scale of close-cut economy which is undoubtedly working a serious injury to the individual inventor and to the commercial and industrial interests of the country at large. One of the most unnecessary and irritating instances of this is to be found in the fact that the files of copies of patents at the Patent Office are kept in such a depleted condition that it is often impossible to get copies of patents without waiting to have them specially printed. Formerly, it was the custom of the office to keep the files well filled. Should the copies of a particular patent run out, a fresh series was immediately printed, and it was a rare occurrence for an application for copies to be made that could not at once or very shortly be filled. Of late, however, the conditions have changed, and patentees, manufacturers, and the public at large are suffering a great deal of vexatious and utterly unnecessary delay and inconvenience. Matters have reached such a pass that a patentee cannot obtain over ten copies of his patent at one application, the explanation given being that the appropriation from Congress has run out and the department is short of funds.

This is a matter of very vital importance both to the Patent Office and the general public. It is the aim and duty of the Patent Office to give the public every possible facility for examining and keeping in touch with the progress of invention in every department of industry, while the inventor, the manufacturer, and the merchant have many cogent reasons for wishing to be kept so informed. Whenever a new patent, especially if it is of radical and far-reaching import, is issued, it becomes a matter of solicitude to all inventors whose investigations cover the same or kindred fields, and to manufacturers and merchants the economic aspects of whose business may be vitally affected by the new invention. There is an immediate demand for copies, and much inconvenience and possibly no little loss may be experienced when it is found that such copies are not available, especially if reply is received from the Patent Office that it is doubtful whether any more copies will be immediately forthcoming. Not only are the patents allowed at present to remain out of print, but in many cases the applicant is required to give special reasons why he should be supplied, such, for instance, as that he requires the copies for use in a court; and it is only after receipt of such explanations that the Patent Office will undertake to furnish them. Another instance of this petty, and as we have shown, very harmful economy, is the law which permits the Patent Office to print the Official Gazette only in "numbers sufficient to supply all who may subscribe therefor at \$5.00 per annum" besides such as may be required for State and public libraries on the order of Members of Congress, etc., "with 100 additional copies." These 100 copies are for sale in single copies only, and if any one should wish for more copies, say half a dozen or a dozen, he will be politely refused. Here is another instance of that irritating and foolish parsimony which is causing endless irritation and, we believe, working no little injury in certain specified cases.

We commend the subject to the earnest attention of inventors and manufacturers throughout the country with the suggestion that they urge upon their representatives in Congress the necessity for a more generous and reasonable policy in dealing with the Patent Office. Appropriations for reprints should be greatly enlarged, and they should be accompanied with specific directions for keeping the files of copies of patents amply supplied and for immediate reprinting upon the expiration of copies.

A Transparent Mirror.

Mr. Richard Wilson, of 99 Fourth Avenue, New York city, N. Y., has recently invented a mirror which reflects images or is transparent according to the amount of light in the background, that is, when the background is darkened the glass is a perfect mirror reflecting objects in front of it, but when the background is lighted one can readily see objects through the glass. The mirror is silvered with a thin coating of transparent reflecting material. The inventor proposes to use the mirror for illusive stage effects or in show windows as an advertising medium. The darkened