Scientific American.

ESTABLISHED 1846.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included.....$3 20
One copy, six months, postage included..... 1 60

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

☞ The postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written. In case of changing residence state former address, as well as give the new one. No changes can be made unless the former address is given.

Scientific American Supplement.

A distinct paper from the SCIENTIFIC AMERICAN, but of the same size and published simultaneously with the regular edition.

TERMS.

One year by mail.....$5 00
SCIENTIFIC AMERICAN and SUPPLEMENT, to one address..... 7 00
Single Copies..... 10

The safest way to remit is by draft, postal order, or registered letter.

Address MUNN & Co., 37 Park Row, N. Y.

☞ Subscriptions received and single copies of either paper sold by all the news agents.

VOLUME XXXV., No. 18. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, OCTOBER 28, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

THE SCIENTIFIC AMERICAN SUPPLEMENT.
Vol. II., No. 44.
For the Week ending October 28, 1876.
With 49 Illustrations.

TABLE OF CONTENTS.

SOME EXTINCT AMERICAN ANIMALS.

When the theory of evolution began to displace the old theory of specific creation, its opponents were wont to ask triumphantly for missing links. If species are the result of gradual development by progressive variation, they said, we ought to find an abundance of intermediate forms: where are they?

The advocates of evolution could only reply: They will appear when sought for. Darwin even ventured the prophecy that in course of time links would be found connecting the extremely specialized one-toed horse with the normal four and five toed mammals. The readers of the SCIENTIFIC AMERICAN know how completely the prophecy has been fulfilled in the numerous and increasingly specialized horse-like creatures which roamed over our Western plains during the tertiary period of geology. At the beginning of the period the four-toed orohippus was most like the horse that was to be, though it exhibited many unhorselike characteristics. From that time down to the present the chain of development is complete, the precursors of the horse steadily growing more and more horselike in head, and foot, and general structure of body and limb. In the middle tertiary, the mesohippus had but three toes, a slender splint of bone being the only vestige of the lost toe; and in the miohippus the splint had vanished. Later the three nearly equal toes of the miohippus had become three very unequal toes in the hipparion, the large middle toe being the main if not the entire support of the animal. At the close of the period, the prevailing form was a true horse, in which the dwindled and useless side toes of the hipparion had ceased to exist as toes, appearing only as slender splints under the skin. In the modern horse these splints are sometimes seen, attesting its relationship with the horses of prehistoric times.

Similar, if not as positive, evidence of evolution is borne by the remains of tapirs, rhinoceroses, and other hoofed animals. In eocene times the most prominent of the unequal-toed ungulates were the hyrachyus and the palæosyops, the former allied to the lophiodons and tapirs, the latter to the palæotheriums of the European tertiaries. Both these families embraced animals varying in size from a small rhinoceros to a peccary. In the miocene period, these families attained a great development in form, variety, and size: the group became more distinctly separated from each other, and some of them possessed remarkably specialized character. There were, however, no true tapirs, which afterwards became so numerous. The ascendant forms of this period were rhinocerotic, represented by the diceratherum, with its pair of horns side by side on the nose, and the very interesting genus hyracodon, which furnishes a connecting link between the palæotheroid animals of the eocene and the true rhinoceros of the pliocene. The miocene period also produced several species of a more perfect rhinoceros, still hornless. But more remarkable than any of these, indeed in some respects the most remarkable of all the animals brought to light in the strata of the West, were a number of species of grotesque appearance and gigantic size, resembling the existing rhinoceros in general appearance, but larger, some of them approaching nearer to the elephant in size and length of limb. They have been named titanotheriums, brontotheriums, and symborodons, and appear to have died out during the miocene epoch. While they lived they must have played the part of the then extinct uintatherium of the eocene (of which more directly), and that afterwards filled by the mastodons and elephants of later ages.

Very interesting evidence of evolution is also furnished by the equal-toed hoofed animals, represented now by pigs, hippopotami, camels, chevrotains, deer, antelopes, sheep, and oxen. Their remains appear but sparingly during the eocene period, but become abundant in the miocene. During this period the first mentioned family were represented chiefly by huge swine-like creatures, some of which approached the hippopotamus in size. There was also an allied four-toed form, more like true pigs; but all the species were of the peccary type. The sole existing survivor of the form on this continent is the South American peccary, apparently an unmodified remnant of the old miocene fauna.

A much more remarkable family was the oreodantidæ, which began in the later eocene, extended through the miocene, when they swarmed enormously, dying out in the early pliocene. In nearly all points of structure, they were intermediate between ruminants and swine, furnishing a complete line of transition between those now widely separated groups. Their remains are found in great abundance, both in species and individuals; and a gradual modification, corresponding with the chronological position, can be traced from the earlier, more generalized forms to the latest and most specialized: thus affording one of the most complete chains of evidence yet found in favor of a progressive alteration of form, not only of specific but of generic importance, through advancing ages.

Exceedingly suggestive, too, is the history of the camelidæ as exhibited in our tertiary strata. Here was apparently the original home of this singular group, now represented only by the llamas of South America, and the two camels of the old world. During the middle and later tertiary ages, transitional forms from the more generalized ruminants—animals increasingly camel-like and llama-like in character—were abundant in North America, whence they probably migrated during the glacial epoch to the present homes of the existing members of the family, along with the horses, tapirs, and peccaries, which disappeared from this country about that time.

Not less interesting is the story told by the remains of those unique eocene monsters to which the names titanotherium, uintatherium, dinocera, loxolophodon, and eobasileus have been given: huge creatures intermediate between the orders represented by the rhinoceros and the elephant. Professor Flower compares them to broken piers of the bridge by which the gulf, that now so completely divides the orders of the perissodactyle ungulates and the proboscidea, may have been passed over. They were all elephant-like in bulk and general appearance, yet presented a combination of characters which made them unlike anything elsewhere known. Their feet were five-toed, their legs straight and massive; their necks longer than the elephant's, and their small-brained, narrow heads much more like the rhinoceros's than the elephant's. But their distinguished peculiarity was their frontal armament of three pairs of horns, which, with their enormous size and strength, must have made them formidable indeed. Their end is yet a mystery. It has been suggested that at the close of the eocene period they may have migrated to Asia to lay the foundation of that family which first appears in the old world under the more familiar forms of the typical proboscideans—the elephants, mastodons, and mammoths. None of these appear in America earlier than the pleiocene period, a long time after they had become abundant in the old world.

Among the carnivora which preyed upon the abundant herbivorous fauna of the great plains, forests, and lake regions of the tertiary ages, not a few furnish extremely cogent evidence of specific evolution. There were among them fierce creatures, larger than wolves (synaplotherum and mesonyx) which presented such a combination of characters that it is impossible to rank them with either of the existing families of the order to which they belong. In some respects they were like dogs, in others they were bear-like; in still others they were more generalized than any existing members of the order. Then there were several species of hyænodon, some larger than any of the European forms, and others no larger than a fox: "the last survivors of a group notably differing from any now known." In the character of their skulls they stand intermediate between wolves and opossums. In the earlier periods, still more generalized types abounded, some of them combining the generic characteristics of half a dozen of our specialized modern carnivora.

Perhaps the most remarkable of these comprehensive types was the tillodontia, which seem to have combined the characteristics of several distinct groups, the carnivors, the hoofed animals, and the rodents. Some of them were as large as the tapir. Their molar teeth were of the ungulate type, their canines small, their incisors rodent-like. Their heads were bear-like, their general structure like that of the ungulates, their feet plantigrade. Two distinct forms abounded: one in which the incisors grew from persistent pulps, like the beaver's, the other having all the teeth rootless.

The dominent ty of tertiary flesh eaters, however, were various modifications of felidæ, fierce cats, some of them surpassing our modern lions and tigers in size and strength. Chief among them in the miocene age were the saber-toothed tigers, which seem to have overrun the whole world about that time, and to have lingered in some parts until the human period. It is one of the puzzles of palæontology to account for the extinction of this highly specialized type, apparently the fittest of all the cat family to win in the struggle for existence. Happily for man they did not survive in force, to contest his progress toward the mastery of the earth.

PROSPECT OF NEW GERMAN PATENT LAWS.

A correspondent in Berlin sends us the intelligence that a modification of the present oppressive and illiberal system of German patent law is about to be made: that Prince Bismarck has been investigating the code as now existing, has recognized its defects, and will shortly submit to the German Parliament the draft of a new law, the substance of which we give below. As matters now stand, the German patent is practically but little safeguard to the foreign inventor against German piracy, a fact we have stated in a multiplicity of connections. The government itself takes the lead in "adopting" foreign devices submitted to its examination under applications for patents, and it protects its people when they follow its example. We need go no further than the Centennial Exposition to find a striking instance of this in the Krupp guns, wherein is used the Broadwell gas check ring, an American invention, and a necessary appendage to all breech-loading cannon. This was submitted to the German government for trial, and was unblushingly appropriated, and the inventor virtually told to go about his business The invention is styled the Broadwell ring even in German official reports. Krupp likewise "adopted" the invention, and has used it on thousands of guns without paying the inventor a cent. The same has been the case notably with other American military inventions.

Of course it needs no argument to show that such a course is not merely detrimental to the interest of foreign inventors, but also highly prejudicial to the best interests of Germany herself; and of this latter fact the astute Imperial Chancellor has doubtless become fully apprised. The main points of the new law which he suggests are that every invention, excepting, of course, such as are opposed to law or good morals, may be patented. Inventors are not bound to give licences except where such are demanded for the public benefit. The specification must be definite, must be published at a certain time after application, and must embody distinct claims. The first applicant is considered the inventor, disputes as to originality are to be settled by the courts, and, in obtaining patents, foreigners are placed on the same footing as Germans, with the exception, however