[For the Scientific American.]

A CHAPTER ON AMERICAN GEOLOGY.

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In the western corner of the State of Nebraska is a locality fearfully inhospitable to the husbandman, an extensive region untouched by pre-emption claims, and forcing the team of the emigrant, who would seek yet further westward more fertile lands, to wind far and slowly through labyrinthine defiles ere he can pass its difficult barrier.

Yet, though treeless and barren, seldom visited by the kindly waters of the skies, and undimmed by the cabin smoke of the settler, these *Mauvaises Terres*, or "Bad Lands," as they are appropriately named, are to the geologist a true land of promise, no other locality in our country yielding so strange an array of fossil remains.

This region is a veritable mirage to the traveler whose adventurous foot leads him so far into the prairies of the great West. From afar there seem to rise the towers and temples of a mighty city, lifting their fair proportions high into the cloudless air, vast columns as of the capital of some unknown empire of the West. As he approaches, these pinnacles and towers lose their harmonious proportions, and the city sinks into a grand ruin, uplifted in mighty disarray above the level surface of the prairie.

But now, with every step, the mirage fades, and the unlucky Barmecide stops at last before a lofty deposit of hardened clay and marl, through which ages of rain and the slow appetite of running streams have cut, in every direction, cañons, winding in labyrinthine defiles through the *Mauvaises Terres*, rugged passes for the wheels of the dauntless emigrant bound "Westward, Ho!"

Here was, in ancient times, a great fresh water lake, which for ages dropped to its bottom the earthy deposits brought in by the present White river and other streams, till in time the lake was extinguished under its silt of marl, sand, and clay, which has since been uplifted into the elevated and water-worn ruin abovedescribed.

The Bad Lands comprise an area of about 100,000 square miles, the lake they represent having covered the most of Western Nebraska, with an area of some 150,000 square miles. From the source of the White River to what is technically known as the Forks, the surface is, geologically, tertiary, having been laid in that grand third age, of the building of the earth, which has yielded in all parts of the globe such marvellous animal remains. Thence to where it merges in the muddy Missouri, it runs through cretaceous beds, strata agreeing in age with those white chalk and green sand deposits of Europe, which are noted as mausoleums of the gigantic sea lizards of the old oceans, whose exhumed bones have been more the marvel and delight of *savans* than aught beside that the earth has yielded, to the chisel and hammer of the indefatigable rock delver.

At some distance from this stream is another, called the Niobrara, running through similar deposits, the tertiary beds stretching from river to river. South of the Niobrara to the Platte river is a second strange region known as the Sand Hills. Here an extensive area is covered with conical hills of sand, constantly shifting before the wind, and frequently scooped out at their summits into incipient craters. This sandy region is not, however, destitute of vegetation, as it forms a favorite grazing range of the buffalo and antelope.

While the waters were slowly filling up these lowlands with the mud denuded from upland regions, leaves of trees and bones of animals dropped or drifted into the lakes and marshes, and, buried in the mud of the bottom, have been preserved intact to our time. Modern naturalists do not ask much. Give them a well defined leaf and they will reconstruct the tree, give them the bones of a skull and they will rebuild an extinct animal. Even this is frequently denied them, a single tooth being sometimes the basis of an animal reconstruction. Fortunately the teeth, the most durable of animal bones, are also the most significant, being full of evidence of the character, race, and food proclivities of their owners.

In the Bad Lands are found the remains of two distinct animal communities, as described by Dr. Leidy, in Dr. Owen's "Geological Report of the North West." While the lowest bed was being deposited, the lake was probably a great marsh, in which wallowed numerous hippopotami of at least two distinct species. But the distinguishing creature of this period was a huge thick skinned animal, named, from his great size, the *Titanotherium*, or Titanic animal. At the period of the second deposits, there roamed the prairies great herds of an ancient species of hog, partly carnivorous, yet chewing the cud like modern ruminating animals. Of this *Oreodon*, as it has been named, were several species, of one of which Dr. Leidy has found remains of more than 700 individuals.

Three species of hyæna inhabited these plains, together with a tiger, with sabre like teeth. Fierce conflicts took place between these beasts, the marks of which still remain in their fossil skulls. In one hyæna skull were found two wounds on each side the nose, while near by was another skull whose canine teeth exactly fitted the apertures.

Besides these creatures, no longer found on American soil, there existed two species of rhinoceros, supposed, unlike their African representative, to have been hornless. A gigantic weasel, an immense turtle, and numerous other strange creatures, lived and multiplied here, long before these lands had deserved their sobriquet of "Bad." Great has been the change from the occupation of this region by animals no longer found anywhere on the continent, by a vast lake, and umbrageous forests, to its present treeless and lifeless condition.

But these are not all the organic marvels of the region. The more modern beds of the Niobrara yield an entirely dif-

ferent series of animals, of which more than thirty species have been examined, all new to science. A vast period of time must have elapsed between these two formations, for an extensive series of animals to utterly die out, and a new and distinct series to take its place.

In this new commonwealth lived a species of that American elephant, known as the Mastodon; much smaller, however, than that which afterwards existed. But this dwarf is balanced by a giant, or, as Dr. Leidy has appropriately named it, The Emperor of the Elephants (*Elephas Imperator*). This massive brute was one third larger than any other elephant known, living or fossil, yet to attest his imperial dignity there only remain a few scattered bones.

There lived here, also, native representatives of that sand loving creature which modern legislators have of late sought to re-introduce to his old range on the Western plains. No less than four species of camels roamed here, unburdened and unriden. Besides these there was a rhinoceros, resembling that now living in India, two species of deer, an animal like the mountain sheep, a ruminant hog resembling the oreodon, a porcupine, a small beaver, four species of wolves, two animals of the cat tribe, and various others.

Another animal has been introduced by man into this country without any idea that it had ever previously trodden the soil of America. When Darwin discovered the bones of a fossil horse in South America, it was an unexpected revelation to science. But in this region of the Niobrara, no less than twelve distinct species of the horse have been found, ranging in size from that of the Newfoundland dog to that of the largest horse, thus seeming to prove this the true native land of the charger. Though all these animals have long since departed from the earth, their genera are still represented in most cases, but strangely enough most of these representatives are now only found in Asia and Africa.

In the cretaceous deposits are found leaves much more modern in character than those of the European chalk beds. For the flora of the European chalk is no longer represented on that continent, and its family relations connect it with Indo-Australian instead of modern European plants. It had thence become a maxim that the cretaceous period was entirely unrepresented in modern plants. But these American beds have quite overthrown this idea, yielding plants that closely conform to those now living. These plants are related to those found in European tertiary beds, showing that America was far ahead of Europe in its organic development, and has far better claims to the title of the Old World.

Testing Lubricating Oils—Invention wanted.

In an editorial upon this subject, the *National Oil Journal* remarks: Some practical and inexpensive method of testing the quality and relative value of different kinds of lubricating oils, is a standing want on the part of large oil consumers.

We know that some of our best railway managers comprehend the importance of this matter, and are anxious that some method should be devised which will secure them against the contingencies we have indicated. The Great Western railway company of Canada is the only one, so far as we are aware, that has undertaken a practical solution of the question. At their machine shop, in the city of Hamilton, they have erected a very simple yet thoroughly practical machine for the purpose of testing lubricating oils. It consists of an ordinary car axle arranged to run in ordinary journal boxes. The axle is run by belts from a stationary engine at a uniform rate of speed, and under a pressure of 2½ tons to each journal—equivalent to ten tons to a car. The packing and all the other conditions of the test are made to correspond as nearly as possible to those of a car in motion on the road. A thermometer is so arranged as to indicate the exact temperature, and during a trial all the conditions of the test are recorded in what is called the test book. No oils are purchased nor allowed to be put on the road without being first tested by this machine.

It may not be inappropriate to give in this connection a brief description of a machine for a similar purpose, but of more elaborate construction, built a few years ago by the authorities at the Brooklyn Navy Yard. In this case the tests were designed to be analogous to the requirements for the main bearings of screw steamers. For this purpose a shaft with journals 9 inches in diameter was fitted to revolve in appropriate brasses. The upper brasses, instead of being secured by the usual caps, were weighted by a system of levers so arranged that the pressure could be graduated at pleasure and accurately measured. By running at a uniform rate of speed, with a counter attached to each shaft and a thermometer in each one of the upper brasses, they were able to keep an exact record of all the conditions of the tests. In operating the machine the pressure on the journals was gradually increased until the maximum that could be sustained without increasing the temperature above 116° Fahrenheit was ascertained. This maximum pressure, other conditions being equal, was taken as an index of the relative merits of the oils tested. It was found that by applying winter sperm oil at the rate of one half gallon in 25 hours, the journals would just stand a pressure of 9400 pounds without increasing the temperature. Under the same conditions summer sperm was reported as standing a pressure of 11,164 pounds, and lard 8,000 pounds. The best grades of petroleum lubricators stood from 8,000 to 9,000, while the various inferior mixtures and compounds were represented by greatly reduced figures. It appears that the operators conducted all their experiments with uniform quantity of oil and a graduated pressure. We think they would have rendered their report far more valuable if they had varied the test, and added a table of results in running with a uniform pressure, and the quantity of oil graduated to the apparent requirements of the journals. A purchasing agent, with a machine of this

kind adapted to this use, would be able not only to guard against annoyance and damage from inferior goods, but would be able to determine with far greater accuracy than at present, the relative value of the different grades of lubricators in the market. He could go to work intelligently to find the true economic mean between high and low priced oils, and could determine for himself the quality and cost of oil adapted to his use. The Brooklyn machine complete cost but \$412. We presume that one possessing all its advantages and adapted to railway purposes might be constructed for nearly or quite one half the money. But in our opinion they would be cheap at double or three times that sum, provided they could not be obtained for less. Will not some one possessed with a spirit of invention, go to work and construct and put on the market a portable machine which will meet all the requirements of the case?

The Art of Employing Time.

Adam Smith has shown, beyond all possibility of cavil, that a great many more pins can be made if the process is divided among eighteen trades, than if each workman is obliged to make every pin from beginning to end himself. So, too, a naturalist, who spends year after year in the observation of red ants, will be likely to learn far more of their nature and habits than could ever be known without making them the objects of special study. There is a story told of a learned German professor who had given his whole life to the study of the Greek article, and who on his deathbed, warned his son to learn from his example, and not to fritter away his time in trying to master too extensive a subject; for he himself had failed in that way, whereas he might have accomplished something if had confined his labors to the dative case. Now it is no mean thing to accomplish something, and there is a deep delight in knowing that a thing done has been done well. Perhaps one is happier if, by dint of patient grubbing for a lifetime, he finally gets to the bottom of one thing, than he would be if, like a swallow skimming over a thousand meadows, he had been merely sipping the manifold sweets of nature, even though he should have sipped of them all.

We would not speak too positively on this point for it is so easy to be wrong. But in so far as we may speak, we will declare our conviction that there is a higher ideal than exclusive devotion to a single end, and that more happiness and the best social results are attainable by an harmonious development of all our faculties, intellectual, moral, and æsthetic. We believe that a state of society is desirable, and we hope it is attainable, in which even the pointer of pins or the lowliest of workers will, in addition to his routine of work (for we do not expect or desire to see division of labor discarded), find both time and inclination to extend his thought over other fields. We feel that no man should, if he can help it, allow himself to be so absorbed in a single pursuit as to find no pleasure elsewhere, and thus dwarf the greater part of his nature. There is a joy in work, it is true, if work be performed with heart and strength; but there are innumerable other joys of nature, which present themselves at unexpected moments in unexpected ways, and must be grasped at once or they are gone forever.—*Exchange and Review*.

The Stevens Institute of Technology.

The late Edwin A Stevens, of Hoboken, N. J., a gentleman of rare intelligence and great wealth, provided by his will, among other benevolent dispositions of his property, for the establishment at Hoboken of a large and splendid institution of learning. He desired that it should be furnished with every possible appliance capable of affording assistance in thorough instruction in the sciences, that the fees for tuition should be moderate, and its usefulness thus widely extended.

Up to the present time the trustees have received from his estate the munificent sum of seven hundred and fifty thousand dollars. They have just completed a noble building in Hoboken, opposite New York, and it is stocked with perhaps the finest collection of scientific apparatus ever brought together.

The Stevens Institute of Technology opens its first session on the 20th of September next, with the following scale of tuition fees: Residents of New Jersey, \$75 per annum; to others, \$150.

The faculty, as will be seen from the advertisement in another column, embraces the names of some of our best and most eminent scientific instructors; Prof. Henry Morton, of Philadelphia, is the President, and under his enterprising and judicious lead the Stevens Institute will undoubtedly take a high rank.

Cheap Postage in England.

New and still cheaper rates of postage went into operation in England, August 1st. Letters and parcels of all sorts, closed or open, without any distinctions, are charged as follows:

Not exceeding 1 oz.....	2 cents.
Above.....1 oz. but not exceeding 2 oz.	3 "
"2 oz. " " 4 "	4 "
"4 oz. " " 6 "	5 "
"6 oz. " " 8 "	6 "
"8 oz. " " 10 "	7 "
"10 oz. " " 12 "	8 "

12 ounces is the limit of weight for letters.

In this country, our rate for letter postage continues to be 3 cents for each half ounce, or six cents an ounce, which is just three times higher than the new English rate for an ounce, and nine times more than the English rate for twelve ounces.

We think our Government might take a lesson from England in the matter of cheap letter postage. But for parcels of certain kinds, our rates are less than the British charges.