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## The Scientific American Supplement

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# AMERICAN CONTRIBUTIONS TO THE DEVELOPMENT

The address which has deservedly attracted the greatest share of attention, out of the many learned essays delivered at the recent meeting of the American Association for the Advancement of Science, is Professor E. L. Morse's masterly summing up of all that America has done to promote the growth of the development theory. Professor Morse is an ardent evolutionist, a naturalist of great learning and ability, an indefatigable investigator, and, like most prominent men in the scientific world, has no hesitation in assuming the offensive in support of doctrines of the truth of which he is deeply convinced. Hence there is nothing resembling trimming in his discussion of the evolution question, the opponents of which receive scant mercy at his hands; but still very many of those whose scientific faith is thus attacked are among the Professor's warmest admirers, for he possesses the happy faculty of being always instructive, always original, and of lifting his topics out of the slough of technical pedantry in which too many of our learned scientists seem over inclined to bury modern acquisitions to our knowledge, especially of natural history.

Professor Morse tells us that the first clear premonition of the doctrine of natural selection came from an American. William Charles Wells, borne at Charleston, South Caro lina, in 1757. In 1813 Wells read a paper before the Royal Society, in which he attempted to account for the color of dark-skinned races of men by citing the changes of animals under domestication, showing that varieties of men and animals were occurring, not exceptionally, but constantly, and that different breeds of animals were thus obtained by man's selective supervision. Hence he argued that a similar selection among men had been effected by the compara tive immunity from certain diseases of those who had dark skins. This is substantially a part of the theory of natural selection now expanded by Darwin and credited wholly to him; but the verdure of originality, it seems, must now fade from the English naturalist's laurels. The honor belongs to an American inventor, who, like hundreds of his brethren since his day, has furnished the thoughts whence have sprung some of the most noted of foreign "discoveries." This is unquestionably the most important fact broughtforward in Professor Morse's paper, and it will provoke uni versal comment.

Classifying the work of various American investigators, Professor Morse tells us that in producing new evidences for the doctrine of natural selection. Drs. Burt G. Wilder. Englemann, and W. K. Brooks and Professor Charles V. Riley have borne distinguished parts. Professor Riley's proof of the inter-dependence of flower and insect in the case of the yucca moth is a scientific triumph. The late Professor Jef fries Wyman completely ruined the beautiful theory that the cells of bees were of such construction as to use space and material to the best possible advantage. He found by close study that the cells of all cell-making insects are of all grades, from shapeless masses to those which approach but never reach perfection. The late Professor Chauncey Wright also did admirable work in showing that the arrangement of leaves of plants along their axis, was due to circumstances of growth, and was not a circumstance of

Professors S. F. Baird, J. A. Allen, and Robert Ridgway severally have found that marked differences in birds and mammals are due solely to their surroundings. Thus, for example, Western birds have longer tails than Eastern ones of the same species, and on the Pacific coast birds acquire a darker hue. Large numbers of like changes, when tabulated and shown on a geographical chart, were found coinci dent with variations already ascertained in the amount of rainfall in the different regions. The total number of species of birds was reduced about one fifth by these investigations, and the number of species of squirrels decreased one

As evidences of the transmutation of species, Mr. James Lewis has discovered that a truncate form of mussel, which, by the loss of one of its segments, had been distinguished from another form, takes its peculiar shade from the circumstances to which it had been exposed, namely, the abrasion of its edges and consequent retarding of its growth in the rapid currents of the Mohawk River. Mr. A. G. Wetherby has called attention to changes in snails under like conditions; and Dr. Cooper and Messrs. Stearns, Bland, and Birney, have all described instances in which changes in animals have followed altered circumstances of heat or mois-Among the examples of the survival of forms by adaptation to changed environment, the discovery by Mr. Ernest Ingersoll of marine mollusks and living salt water crabs, high up on the Rocky Mountains, is the most remarkable Professor Marsh has made a series of brilliant researches concerning the siredon, an animal of the salamander kind, that loses its gills, and becomes, when removed from its natural habitat, one previously recorded under an entirely different genius (amblystoma). The researches of Drs. Packard and Putnam have overthrown Agassiz' theory that the blind fish of the Mammoth Cave are of a race crea ted in their present condition by showing that a whole series of fishes, ranging from those with perfect eyes to those without any, including between them various deficiencies of vision, have been found in American caves and secluded waters. The discoveries of Professors Leidy, Marsh, and Cope, among the tertiary mammals of the West, have filled wide gaps between older and existing forms, showing all the intermediate animals, so that we have nearly the whole ances try of the horse, back to the five-toed animal, not larger than a fox, in the cocene period.

The remainder of Professor Morse's admirable address

sets forth the present theories of Darwin and the evolution school, and more especially dwells upon the gradual devel opment of the intellect of animals. The earliest mammals had the smallest brains; and as we go upward in the strata, the size of the brain gradually increases. Its development in the monkey tribe was regarded as the means by which these animals were enabled to escape from the carnivora which formerly abounded; and intellect even in that early era thus proved its superiority to brute force.

In his conclusion, Professor Morse showed how perfectly the evolution doctrine accounts for the fatalism of the Turks, the cruelties of savages, and the outrages generally among civilized people, attributed to the total depravity of humanity. He considers all such manifestations as simply relapses to the savage nature which we all inherit from animal progenitors; and that where such relapses in anv individual become constant, it is the duty of society to treat that individual practically as it would a dangerous beast, and so govern him as to prevent his propagating his kind.

### THE COMING EXPLOSION AT HELL GATE.

General Newton has recently stated that the great explosion at Hell Gate will take place during the latter part of September. The excavations have been complete for some time past, but delays in passing the appropriation bill by Congress checked further operations, and for this reason the blow-up did not occur on the 4th of July, as for a long period was contemplated. Those who expect to witness a gigantic column hurled hundreds of feet into the air, or look forward with some trepidation to the effects of fearful concussion on adjacent buildings, will hardly find their anticipations realized. The mine will be flooded previous to the explosion; and with the possible exception of jets forced through seams in the rocks, there is no reason to believe that any very remarkable exhibition of the tremendous force of the explosives will be manifest. From a scientific point of view the occasion will be of considerable interest, as the earth in the vicinity will be shaken by the communicated vibrations, which are likely to travel over a long distance. An opportunity will thus be afforded for measuring the velocity of sound waves through earth, and preparations are being made by scientific men to observe the same at points at distances 200 and 300 miles away.

The arrangements to guard against any possible danger are being perfected, in utter disregard of the desires both of those who hope to see the great blast, and those who aspire to profit pecuniarily through the popular curiosity. Steamboats and other craft will be warned away, so that a view from the river will be out of the question; the authorities have been requested not to grant passes to would be spectators on Ward's Island, the best point of observation; and a bluff of earth and the buildings near the works prevent seeing the operations from the rear, so that the expectant populace will probably have to satisfy themselves with a distant view from the high land on the New York shore.

How much powder, etc., will be burnt is not yet definite ly stated. An approximate idea of the quantity may be gathered from the fact that there are about 4,000 drill holes. each 3 inches in diameter, and varying from 7 to 13 feet in depth. Each will be charged with a separate canister of dynamite, vulcan, and rend-rock powder, and the simultaneous explosion will be effected by the current from a battery of 800 cells. About two pounds of powder are used to one of dynamite, and the charges are inserted in the 173 piers of rock and in the roof supported thereby. It is estimated that 30,000 cubic feet of broken rock will be left under water, and this will have to be removed by dredging so as to secure a channel 26 feet in depth. The total length of tunnels, galleries, etc., excavated, is 7,425.67 feet. The amount thus far expended is \$1,686,841.45.

### CHEAP COAL.

The breaking up of the coal combination and the consequent throwing upon the market of half a million tuns of coal is a welcome event. The whole coal trade of the East has, for several years, been under the absolute control of a monopoly which has signalized its sway by unwaveringly maintaining high prices, without regard to the demand first, or the depressed condition of all business affairs. It is characteristic of the patience of our people that no means have been tried to mitigate this condition of things; but now that the crisis has come, it is like a gleam of sunlight through the black shadows which have fallen across the prosperity of the industrial world. When coal is once more bject to the natural laws of trade and not until then its traffic rest on a sound basis; and when this comes to pass, then we may look for a revival in iron manufacture, and in all the industries in which steam is used. Too many people are undergoing the effects of long existing business stagnation not to watch eagerly for any sign, however faint, indicative of better times, and therefore the gratification felt and openly expressed, at the collapse of the combination, is undeniably great. One public sale of 500,000 tuns will not affect the whole winter's trade, however, any more than one cold day represents the whole winter's weather; but as matters now appear, the present event is only a beginning, and predictions are freely hazarded that we shall see still lower prices.

The fall in rates at the late auction seem to have astonished every one, and none more than the coal dealers themselves. The reduction from the combination schedule for August averages about \$2.10 per tun, and average prices ranged from \$2.20 for Philadelphia & Besting chesnut to \$3.86 5 Delaware & Hudson stove. The Vice-President of the Pennsylvania Coal Company asserts that it would cost \$500,000 more to mine the coal than the prices fetched at