

EVOLUTION

Glaciers Caused Geological Moving Days

Animals Forced to Migrate and Evolution Speeded Up When the Earth Became Uneasy and Started to Chill

By FRANK THONE

"EVOLUTION, not revolution," is a nice-sounding catchword used on all sorts of occasions by all sorts of people, especially by conservative politicians posing as liberals. But a broad view of the evolutionary stage, recorded by a leading scientist who has just left it, indicates that evolution has often proceeded by great jumps, and that these waves of change, both in the species of animals and in their distributions, were responses to geological revolutions in the uneasy old earth itself.

One of the last writings by the late Prof. W. D. Matthew of the University of California was a condensed but inclusive inquiry into the causes of animal migrations and evolution during geologic time, especially during what may be called more recent geologic time—the last hundred million years or so.

He found, as the result of his years of study of animal evolution as disclosed by the fossil record, that there has been a sort of long rhythm in the development of life. There have been long, peaceful periods of uniform, moderate climate all over the earth, when animals have been pretty well satisfied with things as they found them and have not bothered to change much. Then there have come other periods of turmoil and change—heaving up of mountains and plateaus, gathering snows on their tops turning into vast glaciers, climates no longer uniform but sliced up into zones; life no longer easy and comfortable but full of change and uncertainty, so that a species must meet outer change with inner change, or else pay the high penalty of extinction.

Three times at least, as Prof. Matthew read the record, have such major revolutions upset the earth, prodding the plodding steps of evolution into a jazzier tempo. Three such major revolutions, with other lesser ones in between, some of them possibly more or less local in their effects.

The first of them came a most unimaginably long time ago, long before the Age of Coal, long before the Age

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of Fishes that preceded it. What that revolution ended is unknown. What it started was a livelier development of the lower orders of life, and either the beginning or—more likely—the energetic unfolding of the vertebrate family tree. Expressed at first only as fishes—some of them fearful and fantastic, others more like some of the modern forms—this evolution of the backboned animals got as far as the beginnings of the lowest land-dwelling, air-breathing animals, relatives of toads and salamanders, before the second great revolution ended the epoch and initiated a new age.

Dinosaurs Ruled

The aristocracy of this second dispensation were the famous dinosaurs, that wallowed in the swamps and swam the seas and clawed and tore each other on the solid land. But while these ponderous gentry were ruling the earth and caring no whit about changes to come, meek little primitive animals, weak of body but beginning to be nimble of wit, kept out of their way as well as possible and prepared to inherit the earth. The dinosaurs had their day, but in the end they ceased to be.

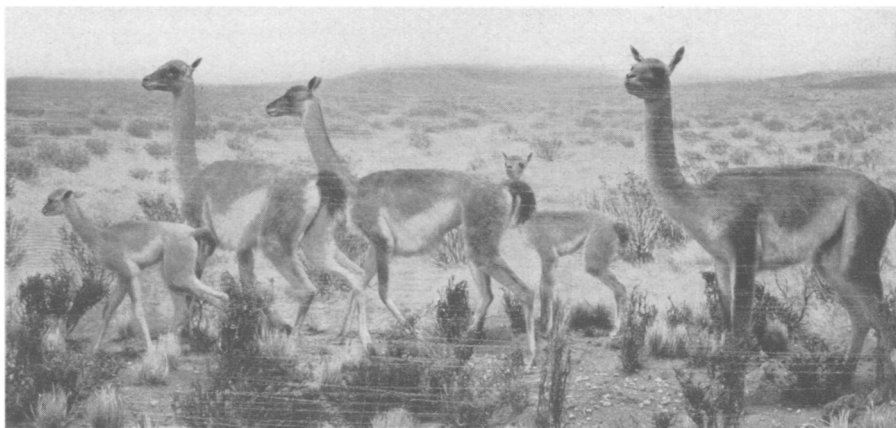
They ceased to be, perhaps, because the earth was coming to a long period

of change, of mountain-upheavals and plateau-liftings, of beginnings of zonation in climate that culminated in the most recent and perhaps the most severe of all the ice ages the earth has known. We are still but half-emerged from this ice age, for Greenland and Antarctica are still buried under permanent ice and every winter a wide snow cape spreads itself over most of the temperate zones.

The ages that stretched themselves between the end of the dinosaurs' dominance and the melting away of the glaciers that covered most of Europe and more than half of North America were times of the most rapid animal evolution that the world has ever seen. Together they are lumped by geologists as "Tertiary" time. It is an old-fashioned name, and does not mean today what it did when first applied, but it is a convenient classification.

But better than "Tertiary" is the name, Age of Mammals. For it was during this time that the warm-blooded, milk-giving creatures, to which man himself as a physical being is related, went through the series of changes that brought them to their present state. More swiftly than any other great class of animals ever evolved, the mammals of the Tertiary deployed themselves, tried out and discarded experimental models by the dozen and hundred, and at the end got down to something quite like 1931 designs.

This speed in evolutionary change was due to an antecedent restlessness in



Photos by Courtesy of Field Museum of Natural History.

CONSERVATIVE CAMELS

The camel tribe originated in America. Conservative members that stayed at home and grew no humps left llama and alpaca as descendants; the wanderers across the Bering region became the humped species of the Old World.



THE TREK

When great, sad elephants marched through snows in Asia and Alaska during glacial days.

the earth itself, Prof. Matthew believed. There was mountain-building at intervals all during Tertiary time. Some of our greatest ranges, such as the Rockies, the Sierras, and in the Old World, the Himalayas, were either lifted up entirely or received notable additions during that epoch. Naturally, with so much disturbance going on, there must have been grave upsets in the woodland and pasture economies of the animal world. Even though the changes may have taken many thousands of years, they brought about new climates, and new climates produced droughts or excessive rains, over-long winters or too-hot summers, in regions where things had been Edenic before.

Confronted with increasing rigors, the animals in such regions had but three choices: adapt themselves, move out in search of a new home like the old one before the change, or—die. Species did all three, their choice depending on adaptability, mobility, and innate, stubborn conservatism. But to adapt means to evolve on the spot; to move means to face the competition of new neighbors, forcing adaptation again. Even to die worked as a cause of adaptation, for if you didn't change, the neighbor who moved into the place you vacated probably did.

But not only did the uneasy earth thus compel its animal tenants to change with its own changes; it guided the migrations that its new climates brought about. Through the shape of the lands, the trend of its mountain ranges, the distribution of its deserts and inland seas, it made highways in certain directions and placed barriers across roads in others. It pushed warmth-loving animals southward with lengthening winters and at last with

mile-thick ice in permanent glacial caps; and as they moved in search of more summer and less winter, it either encouraged them with a Mississippi valley, or halted them with Himalayas and Caucasus and Alps.

The disposal of the continents, Prof. Matthew pointed out, has a strong bearing on the history of animal migrations. If you will examine a globe, turning it so that you can look at it directly from the top, you will see that most of the land area of the world lies in a huge circle around the Arctic Ocean. What lies below the equator can be counted as mere peninsulas: the pointed ends of Africa and South America, and the island continent of Australia, connected to the mainland through a chain of smaller islands.

Land Bridges

There are two gaps breaking this land ring at present, a narrow one at Bering Strait and a wider one across the North Atlantic. Bering Strait has unquestionably been closed by a land bridge, not once but many times. And land bridges by way of Greenland and Iceland to Europe may have existed also; the ocean is comparatively shallow at that end, most of the way.

What these northern lands may have been like, in days when there was no permanent ice, can be left to the romantic imagination. Fossil leaves of trees like those now found in California and the Gulf States, as well as those of the cooler but still rich lands of Michigan and New York, have been found in Greenland. We need only to think of how it must have been on the earth, when the vast stretches of northern Siberia and Canada, now dreary tundra and swamp and muskeg, or at

best dense spruce growth, were covered with game-filled hardwood timber like the virgin forests of the Ohio and Mississippi valleys. Only they had stranger beasts in them: rhinoceros and elephant and giant bison, as well as the more familiar deer and wild pig.

Then the uneasiness of slow upheaval, the increasing chill, the shortening summer and the diminishing of the familiar food supplies. Some beasts perish, some change their habits to meet the new conditions; perhaps most of them wander restlessly southward, edging year by year a little more toward the lands of the sun.

Perhaps some of the migrants might try occasionally to go back to the old home, but they would always run into forests where they could not find the right kind of food, or cold nights that made them glad to resume their southward trek, or quaking bogs that would swallow them, meat and bones, if they persisted in attempting to cross.

If any of them had been able to push on northward, after a suitable lapse of centuries, they should have come at last to a barrier that nothing without wings could cross: mountainous ice, stretching endlessly back toward the north. This ice was more than a blockade to northward travel on either continent; it was a closed door. The ring of land around the Pole was broken; East was East and West was West, and the animals of America, cut off from those of the Old World, could no longer intermigrate and interbreed. Hence the development of separate species below the barrier.

Strangely enough, although ice covered America about as far south as the Ohio river, and Europe from the Arctic Ocean to the (Please turn to page 268)

The Courage to Predict

properties of unknown elements from the general Periodic Law was characteristic of

MENDELEEFF

(or Mendeleyev)

whose specifications for elements and their compounds then undiscovered forms the next

CLASSIC OF SCIENCE

charge themselves if this plate is positively electrified, either by being in metallic connexion with the positive electrode of the lamp or with a separate positively charged body. When the plate is simply insulated the stream of negatively charged carbon molecules brings down this insulated plate to the potential of the base of the negative leg, or to the potential of that part of the carbon conductor from which it is receiving projected molecules. These carbon molecules projected from an incandescent conductor can carry negative charges, but either cannot be positively charged, or else lose a positive charge almost instantly when projected off from the conductor. . . .

SPACE TELEGRAPHY, Lee de Forest, U. S. Patent No. 879,532, Patented Feb. 18, 1908.

D REPRESENTS an evacuated vessel, preferably of glass, having sealed therein three conducting members, F, a and b, in the figure. The conducting

member or electrode F is shown as consisting of a filament, preferably of metal, which is connected in series with the battery A or other source of electrical current of sufficient strength to heat said filament, preferably to incandescence. The conducting member b, which may be a plate of platinum, has one end brought out to the terminal 3. Interposed between the members F and b is a grid-shaped member a, which may be formed of platinum wire, and which has one end brought out to the terminal 1. The local receiving circuit, which includes the battery B, or other suitable source of electromotive force, and the signal indicating device T, which may be a telephone receiver, has its terminals connected to the plate b and filament F at the points 3 and 4 respectively. The means for conveying the oscillations to be detected to the oscillation-detector, are the conductors which connect the filament F and grid a to the tuned receiving circuit and, as shown, said conductors pass from the terminals 2 and 1 to the armatures of the condenser C.

I have determined experimentally that the presence of the conducting member a, which as before stated may be grid-shaped, increases the sensitiveness of the oscillation detector and, inasmuch as the explanation of this phenomenon is exceedingly complex and at best would be merely tentative, I do not deem it necessary herein to enter into a detailed statement of what I believe to be the probable explanation.

Science News Letter, October 24, 1931

Geological Moving Days

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Alps, there was no glaciation in Asia. All of Manchuria, Mongolia, eastern Siberia, were ice-free. That does not mean that they were not cold. They probably had very severe winters, but in summer the ground thawed out and raised its usual crop of plants, and herds of animals grazed and browsed and wandered where they would.

Interior Alaska was also unglaciated, and probably there was a land bridge to Asia, so that during that time there was free migration of such creatures as the great hairy mammoth and the musk-ox between the two continents. Only they could not get southward, for advance along the west coast of North America was blocked by the Cordilleran glacier front coming down to the sea.

The southward migration of the animals did not take place as a single, gradual, coordinated movement, in Prof. Matthew's opinion. Instead there were a number of separate dispersals, or waves of migration; perhaps one to each slow convulsion of the earth.

Man No Exception

The most advanced of animals, Prof. Matthew pointed out, came down out of the cold lands latest and are still found predominantly in north temperate and subtropical regions: dogs and wolves, bears and raccoons, weasels and otters, deer and horses, and cats of all degrees.

Man himself is no exception. Australia, which gives asylum to the largest remnant of the primitive first dispersal wave of animals, also has the most primitive of living human races. Other dark races, less primitive but still unadvanced, occupy the forest lands of the southern continental projections—sharing them, by the way, with man's lesser cousins, the apes and monkeys. In the North, nearest the roots of the old glaciers, the most intelligent and progressive races have built their civilizations in Europe and Asia, and have transplanted their culture to that other glacier-scoured continent, North America.

Science News Letter, October 24, 1931

The windiest spot on earth so far found by explorers is on the coast of Antarctica, at Commonwealth Bay.

In the eleven far western states, motor vehicles average about 500 miles a year of travel more than cars in the other states.

MEDICINE

Digestive Ferments Used in Treating Abdominal Adhesions

SUCCESSFUL experiments in the use of digestive ferments to treat troublesome adhesions which may form after abdominal operations were reported to the American College of Surgeons by Dr. Alton Ochsner and Dr. Earl Garside of Tulane University of Louisiana School of Medicine, New Orleans.

Drs. Ochsner and Garside studied 280 animals and found that in every animal adhesions reformed after operation to divide the pre-existing ones. They then tried introducing various solutions into the abdominal cavity after operating on

the adhesions. With a solution of the digestive ferment, papain, few or no adhesions reformed in over nine-tenths of the cases. Papain is obtained from the juice of the fruit of the papaya. Another ferment, trypsin, prevented the reformation of adhesions in nearly half the cases. The theory is that after the adhesions have been divided, the ferments act to assist in removing the excessive amounts of fibrinous adhesions before the organization of the fibrous tissue into new adhesions has occurred.

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