

Competitive Exams: Evolution Studies: Middle Ages

The Middle Ages of the Earth

The story of the earth from the beginning of the Cambrian period to the present day was long ago divided by geologists into four great eras. The periods we have already covered--the Cambrian, Ordovician, Silurian, Devonian, Carboniferous, and Permian--form the Primary or Palaeozoic Era, to which the earlier Archaean rocks were prefixed as a barren and less interesting introduction. The stretch of time on which we now enter, at the close of the Permian, is the Secondary or Mesozoic Era. It will be closed by a fresh upheaval of the earth and disturbance of life-conditions in the Chalk period, and followed by a Tertiary Era, in which the earth will approach its modern aspect. At its close there will be another series of upheavals, culminating in a great Ice-age, and the remaining stretch of the earth's story, in which we live, will form the Quaternary Era.

In point of duration these four eras differ enormously from each other. If the first be conceived as comprising sixteen million years--a very moderate estimate--the second will be found to cover less than eight million years, the third less than three million years, and the fourth, the Age of Man, much less than one million years; while the Archaean Age was probably as long as all these put together. But the division is rather based on certain gaps, or "unconformities," in the geological record; and, although the breaches are now partially filled, we saw that they correspond to certain profound and revolutionary disturbances in the face of the earth. We retain them, therefore, as convenient and logical divisions of the biological as well as the geological chronicle, and, instead of passing from one geological period to another, we may, for the rest of the story, take these three eras as wholes, and devote a few chapters to the chief advances made by living things in each era. The Mesozoic Era will be a protracted reaction between two revolutions: a period of low-lying land, great sea-invasions, and genial climate, between two upheavals of the earth. The Tertiary Era will represent a less sharply defined depression, with genial climate and luxuriant life, between two such upheavals.

The Mesozoic ("middle life") Era may very fitly be described as the Middle Ages of life on the earth. It by no means occupies a central position in the chronicle of life from the point of view of time or antiquity, just as the Middle Ages of Europe are by no means the centre of the chronicle of mankind, but its types of animals and plants are singularly transitional between the extinct ancient and the actual modern types. Life has been lifted to a higher level by the Permian revolution. Then, for some millions of years, the sterner process of selection relaxes, the warm bosom of the earth swarms again with a teeming and varied population, and a rich material is provided for the next great application of drastic selective agencies. To a poet it might seem that

nature indulges each succeeding and imperfect type of living thing with a golden age before it is dismissed to make place for the higher.

Early Periods

The Mesozoic opens in the middle of the great revolution described in the last chapter. Its first section, the Triassic period, is at first a mere continuation of the Permian. A few hundred species of animals and hardy plants are scattered over a relatively bleak and inhospitable globe. Then the land begins to sink once more. The seas spread in great arms over the revelled continents, the plant world rejoices in the increasing warmth and moisture, and the animals increase in number and variety. We pass into the Jurassic period under conditions of great geniality. Warm seas are found as far north and south as our present polar regions, and the low-lying fertile lands are covered again with rich, if less gigantic, forests, in which hordes of stupendous animals find ample nourishment. The mammal and the bird are already on the stage, but their warm coats and warm blood offer no advantage in that perennial summer, and they await in obscurity the end of the golden age of the reptiles. At the end of the Jurassic the land begins to rise once more. The warm, shallow seas drain off into the deep oceans, and the moist, swampy lands are dried. The emergence continues throughout the Cretaceous (Chalk) period. Chains of vast mountains rise slowly into the air in many parts of the earth, and a new and comparatively rapid change in the vegetation--comparable to that at the close of the Carboniferous--announces the second great revolution. The Mesozoic closes with the dismissal of the great reptiles and the plants on which they fed, and the earth is prepared for its new monarchs, the flowering plants, the birds, and the mammals.

How far this repeated levelling of the land after its repeated upheavals is due to a real sinking of the crust we cannot as yet determine. The geologist of our time is disposed to restrict these mysterious rises and falls of the crust as much as possible. A much more obvious and intelligible agency has to be considered. The vast upheaval of nearly all parts of the land during the Permian period would naturally lead to a far more vigorous scouring of its surface by the rains and rivers. The higher the land, the more effectively it would be worn down. The cooler summits would condense the moisture, and the rains would sweep more energetically down the slopes of the elevated continents. There would thus be a natural process of levelling as long as the land stood out high above the water-line, but it seems probable that there was also a real sinking of the crust. Such subsidences have been known within historic times.

By the end of the Triassic--a period of at least two million years--the sea had reconquered a vast proportion of the territory wrested from it in the Permian revolution. Most of Europe, west of a line drawn from the tip of Norway to the Black Sea, was under water--generally open sea in the south and centre, and inland seas or lagoons in the west. The invasion of the sea continued, and reached its climax, in the Jurassic period. The greater part of Europe was converted into an archipelago. A small continent stood out in the Baltic region. Large areas remained above the sea-level in Austria, Germany, and France. Ireland, Wales, and much of Scotland were intact, and it is probable that a land bridge still connected the west of Europe with the east of America. Europe generally was a large cluster of islands and ridges, of various sizes, in a semi-tropical

sea. Southern Asia was similarly revealed, and it is probable that the seas stretched, with little interruption, from the west of Europe to the Pacific. The southern continent had deep wedges of the sea driven into it. India, New Zealand, and Australia were successively detached from it, and by the end of the Mesozoic it was much as we find it to-day. The Arctic continent (north of Europe) was flooded, and there was a great interior sea in the western part of the North American continent.

Levelling Process

This summary account of the levelling process which went on during the Triassic and Jurassic will prepare us to expect a return of warm climate and luxurious life, and this the record abundantly evinces. The enormous expansion of the sea--a great authority, Neumayr, believes that it was the greatest extension of the sea that is known in geology--and lowering of the land would of itself tend to produce this condition, and it may be that the very considerable volcanic activity, of which we find evidence in the Permian and Triassic, had discharged great volumes of carbon-dioxide into the atmosphere.

Whatever the causes were, the earth has returned to paradisiacal conditions. The vast ice-fields have gone, the scanty and scrubby vegetation is replaced by luscious forests of cycads, conifers, and ferns, and warmth-loving animals penetrate to what are now the Arctic and Antarctic regions. Greenland and Spitzbergen are fragments of a continent that then bore a luxuriant growth of ferns and cycads, and housed large reptiles that could not now live thousands of miles south of it. England, and a large part of Europe, was a tranquil blue coral-ocean, the fringes of its islands girt with reefs such as we find now only three thousand miles further south, with vast shoals of Ammonites, sometimes of gigantic size, preying upon its living population or evading its monstrous sharks; while the sunlit lands were covered with graceful, palmlike cycads and early yews and pines and cypresses, and quaint forms of reptiles thrived on the warm earth or in the ample swamps, or rushed on outstretched wings through the purer air.

It was an evergreen world, a world, apparently, of perpetual summer. No trace is found until the next period of an alternation of summer and winter--no trees that shed their leaves annually, or show annual rings of growth in the wood--and there is little trace of zones of climate as yet. It is true that the sensitive Ammonites differ in the northern and the southern latitudes, but, as Professor Chamberlin says, it is not clear that the difference points to a diversity of climate. We may conclude that the absence of corals higher than the north of England implies a more temperate climate further north, but what Sir A. Geikie calls (with slight exaggeration) "the almost tropical aspect" of Greenland warns us to be cautious. The climate of the mid-Jurassic was very much warmer and more uniform than the climate of the earth to-day. It was an age of great vital expansion. And into this luxuriant world we shall presently find a fresh period of elevation, disturbance, and cold breaking with momentous evolutionary results. Meantime, we may take a closer look at these interesting inhabitants of the Middle Ages of the earth, before they pass away or are driven, in shrunken regiments, into the shelter of the narrowing tropics.

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The principal change in the aspect of the earth, as the cold, arid plains and slopes of the Triassic slowly yield the moist and warm low-lying lands of the Jurassic, to consists in the character of the vegetation. It is wholly intermediate in its forms between that of the primitive forests and that of the modern world. The great Cryptogams of the Carboniferous world--the giant Club-mosses and their kindred--have been slain by the long period of cold and drought. Smaller Horsetails (sometimes of a great size, but generally of the modern type) and Club-mosses remain, but are not a conspicuous feature in the landscape. On the other hand, there is as yet--apart from the Conifers--no trace of the familiar trees and flowers and grasses of the later world. The vast majority of the plants are of the cycad type. These--now confined to tropical and subtropical regions--with the surviving ferns, the new Conifers, and certain trees of the ginkgo type, form the characteristic Mesozoic vegetation.