TIMELINE – CHAPTER 10

THE HUMAN ORGANISM AND THE ORIGIN OF LIFE

2005 **Dating of oldest bones belonging to *Homo sapiens*: 195 000 years of age**

A team of American and Australian scientists succeeded in more precisely dating two skulls found in Ethiopia in 1967 (by American paleontologist Richard Leakey). When discovered, the skulls were thought to be 130 000 years old. Australian geologist Ian MacDougall, American geologist and geophysicist Frank Brown and primatologist John Fleague determined that they are actually 195 000 years old. They arrived at their estimate using a radioactive dating technique on the fossils and sediments found around the skulls. Since they were discovered in the Omo River valley in Ethiopia, the two skulls were named *Omo I* and *Omo II*. These fossils are older than skulls (160 000 years old) discovered in 1997 in Herto, Ethiopia, which had previously held the record as the oldest remains of *Homo sapiens*.

1999 **Registration of Miguasha National Park in the Gaspé on UNESCO's World Heritage List**

Miguasha National Park in the Gaspé contains the most exceptional fossil beds in the world. This nature site was added to UNESCO's World Heritage List in 1999 in recognition of the number of well preserved fish and plant fossils dating to the Devonian period. The site is some 370 million years old and contains five of the six groups of fish associated with this geological era. Today the site is recognized worldwide as the most representative of the period, which is also known as the *Age of Fishes*.

1949 **Development of radiocarbon (carbon 14) dating method**

In the late 1940s American chemist Willard Libby developed a dating technique using carbon 14 that allows scientists to determine the absolute age of an object based on radioactivity of minute quantities of carbon 14 in the organic matter. With this method, objects as old as 50 000 years can be dated. Libby received the Nobel Prize for Chemistry in 1960 for his work. To permit dating further back in time—even to Earth's origins—different absolute dating techniques have since been developed, among them a technique based on radioactive phenomena using potassium 40 and argon.

1947 Estimate of the age of Earth as 4.6 billion years

Many scientists have tried to establish the age of Earth. During the fourth century B.C. Aristotle believed that Earth was eternal and the world had always existed. In the time of Copernicus (16th century) and in the 17th century, different ages were attributed to Earth: between 3000 and 7000 years. In the 19th century, the age of Earth was the subject of great debate. At the end of that century, Lord Kelvin (William Thomson) established Earth's age as less than 100 million years, then later estimated it as 24 million years. After 1896, with the discovery of radioactivity, scientists could measure the age of rocks with greater precision. In 1913 English geologist Arthur Holmes in his work *The Age of the Earth* placed Earth's age at about 1.6 billion years; in 1946 he revised his estimate to three billion years. In 1953, thanks to development of radioactive dating techniques, American geologist Clair Patterson determined that Earth is 4.55 (or about 4.6) billion years old by comparing samples of Earth with samples of meteorites.

1926 Discovery of fossilized dinosaur eggs

In the Gobi Desert of Mongolia (central Asia), expedition scientists led by American explorer and naturalist Roy Chapman Andrews (of the American Museum of Natural History in New York) were the first to discover fossilized eggs among the skeletal remains of a protoceratops (a small herbivore with jaws shaped like a parrot's beak). Based on this discovery, scientists were able to confirm that dinosaurs laid eggs. Later more eggs and even nests were found. The eggs were eventually identified as oviraptor ("stolen") eggs.

1915 Introduction of theory of continental drift

In the 20th century, in contrast to the previous century's ideas, scientists tried to prove that the continents have been moving since the origins of Earth. The theory of continental drift was first published by German geophysicist, meteorologist and explorer Alfred Wegener. He believed that at the time all the continents formed a single land mass called *Panagea*. Although he was not the first to suggest movement of the continents, he was the first to provide plausible explanations supporting his thinking and construct a coherent scientific theory. His theory was met with great resistance from the scientific community of the time and set aside because it did not explain exactly how continents move. In the 1960s, thanks to discoveries at the depths of the oceans by American geologist Harry Ness, the theory of plate tectonics was first formulated.

1859 Proposed theories of evolution and natural selection

Many theories have attempted to explain the disappearance of living species and the emergence of new species in nature. English naturalist and explorer Charles Darwin developed a theory for the biological mechanism of evolution, called natural selection, largely based on his findings during an expedition to the Galápagos Island. The theory was published in 1959 in his work *On the Origin of the Species*. Before Darwin, it was believed that extinction was caused by natural catastrophe and that new species materialize from nothing. French naturalist Jean-Baptist de Lamarck was the first to question the theory of catastrophism. In 1809, he proposed his theory of transformation, which was later replaced by Darwin's theory. Darwin provides a better explanation for evolution of the species and is the basis for the theory generally accepted by the scientific community.

1848 Discovery of first skeletons of Neanderthal man

A skull from Neanderthal man was discovered in Gibraltar, a British territory in the south of Spain. This was one of the first discoveries of *Homo* remains. The species *Homo neandertalensis*, once considered to be an ancestor of *Homo sapiens*, has been considered an independent species since 2003. Its name comes from the first public unveiling of the discovery of a fossil from this species, which took place in Neandertal, Germany, in 1856. Later discoveries of skeletons were identified following this unveiling. In 1908 the first complete skeleton of the species was found at Chapelle-aux-Saints, France. Discoveries of human fossils multiplied and the first Cro-magnon (*Homo sapiens*) skeletons were found in 1868, followed by Australopithecus (another hominid) in 1924.

1822 Discovery of first dinosaur fossils

Dinosaur bones were known in ancient times. In China, they were thought to be the bones of dragons; in Europe, they were thought to be bones of giants or large animals such as elephants or rhinoceros. In southern England, in 1822, British geologist and paleontologist Gideon Mantell discovered and identified the first fossilized teeth of a dinosaur he named *iguanodon* for their resemblance to the teeth of an iguana enlarged 20 times. Throughout the 1830s, the search continued but no complete skeleton was found. It was not until 1858 that the first nearly complete fossil was discovered in the United States. The study of these "great lizard fossils" excited the interest of scientists in Europe and the United States. English paleontologist Richard Owen invented the term *dinosaur*, meaning "terrible lizard," in 1842.

1815 Proof that the presence of fossils means certain rocks can be dated

The method for dating fossils was discovered by English engineer and geologist William Smith, who observed that different types of fossils succeed one another in precise patterns in layers of sedimentary rock. He also observed that the same types of fossils correspond to a certain time period and can be used in the dating of rock and the description of Earth's history. He discovered that from one site to another there is always the same sequence of rock layers. French naturalist and anatomist Georges Cuvier, who founded the field of paleontology in the late 18th century, made similar discoveries.

1669 Publication of the idea that deeper layers of rock are older

Following a number of observational voyages to Italy, Danish anatomist and geologist Nicolas Stenon (Niels Stensen) published a book that would become the basis for the study of geology in which he described the process of sedimentation. Sediment, or particles in suspension, settle in layers. He deduced that more recent layers covered older ones and that the fossils found were not formed in the layers but deposited in them during the process of formation. At the time, fossils included all objects extracted from the ground: crystals, ores and petrified remains of ancient organisms.

–550 Discovery of fossils proving the seas were not always located in the same places

With the discovery in Sicily of marine fossils such as shells, fish and plant matter in inland rocks and quarries, Greek philosopher Xenophon deduced that at one time the sea covered Earth. Many regions of the continents we know today were once below the sea, which is why marine fossils can be found there. Like many Greek scholars of the time, Xenophon correctly interpreted the nature of fossils as being traces of once-living beings. However, this idea was not generally accepted until the 18th century, replacing the theory that fossils were made of mud and formed by accident.