

Chapitre II

Brief history of geomorphology:

1/ Catastrophism : is a scientific theory related to biology and geology which attempts to rationally construct beliefs about the origin of the world and the evolution of species by highlighting the impact that short-term catastrophes would have had. , violent and unusual.

The foundations of catastrophism are partially or totally opposed to those of the theory of evolution.

Before the emergence of the theory of uniformitarianism, the dominant belief on the creation of the world and the appearance of life was essentially a so-called unrealistic conception. In Europe, this theory was also based on certain geological and paleontological observations.

The most notable scientific proponent of catastrophism in the early 19th century was the naturalist Georges Cuvier (1769 – 1832). He sought to explain the extinctions and the presence of successions of different faunas on the various geological stages.

According to this theory, species became extinct due to local or global catastrophes, followed by the formation of new species ex nihilo, that is to say that extinct species were found in the form of fossils and that new species were considered immutable (fixism). This theory, linked to that of creationism, was in agreement with the biblical episode: the fossils were the remains of species which did not find a place on Noah's Ark, the last catastrophe being the Flood³.

The disciple of Cuvier Alcide d'Orbigny, a supporter no longer of single but repeated creationism, justified catastrophism by counting in the stratigraphic cuts 28 major crises at the level of fossils which had occurred over 6,000 years.

From the end of the 18th century, several new theories began to challenge catastrophism. The most important of these were transformism developed by Jean-Baptiste de Lamarck and published in 1802 by the Natural History Museum and uniformitarianism formulated by James Hutton. The theory of evolution would then definitively supplant catastrophism.

a/ Giant impact hypothesis

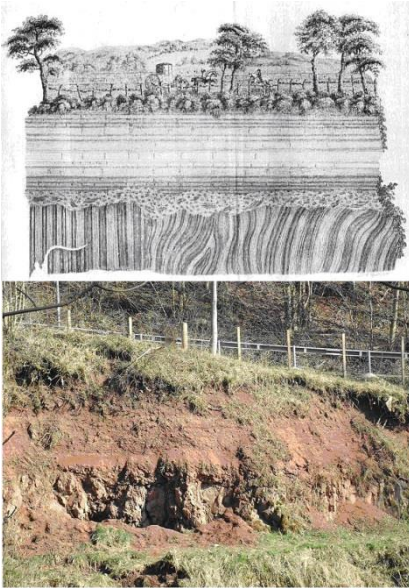
The giant impact hypothesis proposes that the Moon was created from material ejected by a collision between the young Earth and a Mars-sized planetoid body (protoplanet) named Theia. This impact would have occurred 100 million years after the birth of the Solar System.

b/ Cretaceous-Paleogene

The Cretaceous-Paleogene Extinction, or K-Pg7 extinction, is a massive, large-scale extinction of animal and plant species that occurred over a short period of time (on a geological scale) 66 million years ago 'years.

2/ Uniformitarianism : is one of the basic principles of modern geology. It postulates that the processes which took place in the distant past are still taking place today. The adage “the present is the key to the past” sums up the resulting method. This principle opposes the catastrophism according to which the characteristics of the earth's surface appeared suddenly in the past from processes radically different from those at work today.

More precisely, uniformitarianism is the philosophical principle of actualism, which asserts that similar phenomena occur in all times and in all places. Actualism is a method which is based on the transposition of the current system to past systems; its meaning can be more or less strong depending on whether it is purely heuristic or based on experimental approaches.



Comparison of land near Jedburgh in Scotland. The top drawing is an illustration published in 1787, while the bottom photo dates from 2003. Inclined sediment beds have been covered with horizontal beds. This unconformity is the consequence of a long geological period during which deposition ceased while the lower strata tilted. Then the horizontal deposits resumed.

Uniformitarianism was first formulated in the 18th century by James Hutton, then more widely spread by John Playfair and Charles Lyell, actualists who proposed to consider only the slow and gradual action (uniformitarianism) of geological phenomena known today. (actualism).

Uniformitarianism was summed up in 1905 by the famous phrase of Sir Archibald Geikie who refers to the work of Hutton³: “the present is the key to the past⁴”. Before the theory of continental drift, later explained by that of plate tectonics, became accepted in the 20th century, some geologists believed that the Earth's surface had remained largely unchanged since its formation, its cooling from a state in fusion having caused folding forming the mountains. In the last decades of the 20th century, uniformitarianism was modified to account for certain catastrophic events in the earth's past, such as meteorite impacts or periods of intense volcanism. Rather, it is now stated as: "Geological forces are mostly slow and remain the same through time."

3/ Evolutionism : in anthropology, is a social theory which postulates that it is possible to generate laws explaining the evolution of societies. Certain old currents were criticized for having postulated a mode of linear evolution based on the unique model of development of Western society. But the various anthropologists who call themselves evolutionists today, such as Alain Testart and Christophe Darmangeat, propose non-teleological and non-ethnocentric evolutionary theories.

Since its emergence as a science in the 19th century, anthropology has placed itself within an evolutionary paradigm. For the anthropologists of this era, the human species is one, and therefore, each society follows the same evolution from the “primitive” state to the model of Western civilization.

This paradigm was exclusive in anthropology for many years and there are many criticisms to be made of it. First of all, he applies evolution (in the sense of progress) to notions such as social organization or religion. Furthermore, he considers that all societies evolve in the same direction to arrive at true “civilization”, the model of which is modern Western civilization. Indeed, for Mondher Kilani evolutionism is unilinear.

Relations between anthropological evolutionism and the theory of evolution

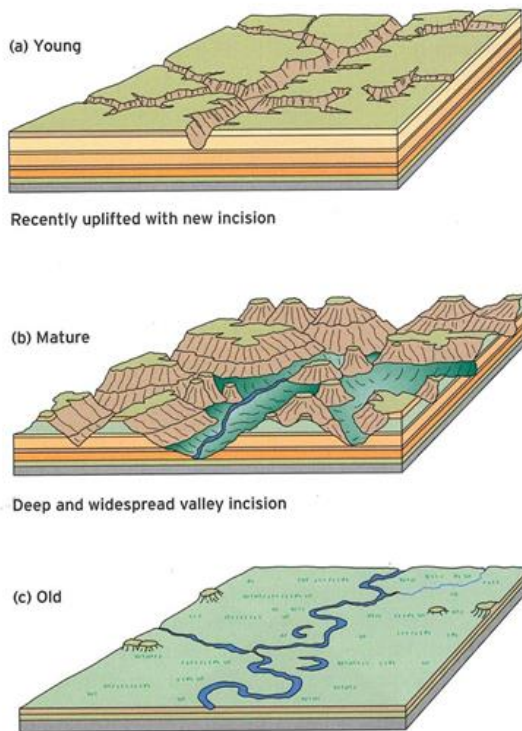
The commonly expressed idea according to which social evolutionism comes from Charles Darwin's theory of evolution cannot be accepted without underlining the anteriority of the theories of the struggle for survival in human societies from the beginning of the 19th century. The influences went in both directions The Darwinian theory.

4/ The Davis model :

William Morris Davis is famous for his theory of the erosion cycle. It explains the creation and evolution of relief forms in three successive stages: stage of youth (raised relief), stage of maturity (action of erosion), stage of old age.

According to this theory, the orogeny is followed by a long phase of tectonic stability without rejuvenation of the relief, which is called peneplain.

In this model, when deformation and erosion are prolonged over a long period of time, the landscape is then in a state of dynamic equilibrium.



Geomorphological cycle of Davis (1889, 1899, 1909): a) Young stage of a recently raised relief with a recent and therefore limited incision, b) mature stage of a relief with deep valleys, c) old stage of a eroded landform (redrawn by Holden, 2005).

5/ Modèle de Penck :

Defended the theory of growth and decay of relief. The ancient Black Forest massif, tectonically incorporated into the Alpine foreland during the formation of the Alps, was one of the regions chosen to test the continuous and constantly accelerated dome uplift model. The propositions on the genesis of the piedmont stairs, refuted by Davis, the status of the Penck work was re-evaluated during the 1970s. The systemic approach combined with a better physical understanding of threshold effects facilitated the acceptance of ideas that were originally poorly understood or distorted, ideas that fertilize the history of theories in geomorphology, hillslope geomorphology (theory of slopes) and tectonic geomorphology.

6/ Model by Eduard Brückner:

This anthology of studies by the eminent geographer and climate scientist Eduard Brückner (1862-1927) on anthropogenic climate change. The studies published here were chosen to demonstrate Brückner's wide-ranging scientific interest in climate variability, his extensive empirical research and theoretical analysis of climate change, his assessment of contemporary analyses and thinking about anthropogenic climate change (such as the widespread concern about desiccation). Brückner's formidable ideas should have a significant impact on our present views of climate, climate variability and climate impact.

7/ Alberecht Penck model :

The work of the Pencks was, however, at the heart of discussions in geomorphology before 1940: against the raised peneplains, Albrecht (the father) defended the theory of the Gipfelflur and the Oberes Denudationslevel; against the theory of the geographical cycle, Walther (the son) defended the theory of the growth and decline of relief. The ancient Black Forest massif, tectonically incorporated into the Alpine foreland during the formation of the Alps, was one of the regions chosen to test the continuous and constantly accelerated dome uplift model. The status of the Penck work was re-evaluated during the 1970s. The systemic approach combined with a better physical understanding of threshold effects facilitated the acceptance of ideas that were originally poorly understood or distorted, ideas that fertilize the history of theories in geomorphology, hillslope geomorphology (theory of slopes) and tectonic geomorphology.