

The Mons Basin aspiring Geopark

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ABSTRACT

The Mons Basin, an original Meso-Cenozoic subsiding area of 75 km², resting on its Palaeozoic substratum constitutes the core of the Mons Basin Geopark (100 km²). The stratigraphic succession, from the Lower Devonian up to the Quaternary yields a rich geoheritage panel of minerals, rocks, fossils and geological phenomena of high educational value. The vocation of “La Malogne” association originated from this geoheritage resource which is currently in application, for example in the nature-guide courses for adults and children. This is also the case for field trips and other support to educational and scientific works.

Thirty geosites, museums and scientific attractions form and develop the geoheritage of the Mons Basin in the perspective of the history of the Earth and of Humanity. The landscapes of the Geopark are sprinkled of coal heaps that are witness of the coal mining revealing the interdependence of the Man and the underground resource. This relationship is an integral part of the inheritance of the Mons basin where the first raw material extraction began some 10.000 years ago in the Spiennes flint mines, when Neolithic people dug in the chalk, deep shafts and galleries searching flint beds to provide huge axe open air workshops.

Without such exploitation of raw materials, coal, phosphate, chalk, sand... some major palaeontological discoveries never happened. This is especially the case of the Iguanodons of Bernissart found thanks the mining works in a

coal mine in a “natural pit” full of Lower Cretaceous sediments. On the same way, Mosasaurus were extracted from the Maastrichtian phosphate chalk and Champsosaurus from Eocene sands.

The Mons Basin Geopark was initiated by the « La Malogne » association, under the auspices of University of Mons and with the support of the Walloon Region. It concerns about twenty counties that are interested in developing a scientific tourism on their territories.

Introduction

The Mons Basin is an E-W elongated synforme of about 75 km² that has been subsiding during the Upper Cretaceous, the Paleocene and the Eocene (Fig.1).

The maximum observed thickness by formation is about 400 m, but the total maximum thickness of all formations is 1350 m (Robaszynski et Dupuis, 1983; Dupuis and Robaszynski, 1986). This indicates a particularly complex subsidence history and geography (Cornet, 1928; Marlière, 1970). Four phases can be differentiated. The first one was active during Barremian times and is related with the subterranean dissolution of thick Viséan (Mississippian) anhydrite beds between 1000 m and 2000 m in depth (Delmer, 1972; Dupuis et Vanduycke, 1989). Subsequent phases developed during the Upper Cretaceous till the Eocene but under a complicated tectonic control of a dextral strike-slip regional fault. The tectonic study of the evidence of synsedimentary faulting suggests a pull apart system (Vanduycke *et al.*, 1988). This clearly points to a subsidence dynamics quite different from the one of the neighbouring Paris Basin and to the strong originality of the Mons Basin.

The Mons Basin is juxtaposed against the Midi Fault, the most important thrust of the variscan front (Fig.1). This fault is southwards dipping with a low angle W–E orientation and put the allochthonous Ardenne nappe over the Namur parautochthonous. In the considered area the Ardenne allochthonous is mainly composed of Devonian folded beds. The Namur parautochthonous comprise Devonian, Mississippian and Pennsylvanian warped and faulted strata. The

Pennsylvanian contains the coal measures which were extracted since the 17th Century and which powered the Industrial Revolution until the middle 20th century.

Quaternary deposits are abundant and has given remarkable prehistoric sites (Maisières-Canal, De Heinzelin, 1966). The Spiennes underground flint Neolithic mines is among them and now UNESCO World Heritage site (Fig. 5). The thick accumulation of loess and loams that cover the chalk of the southern flank of the Mons basin at Harmignies provides a regional reference section for the last glaciation. The Mons Basin is sometimes called basin de la Haine according the name of the river which flows along its axis demonstrating a recent tectonic activity which is currently represented by rather strong earthquakes.

This brief overview shows that, gathered in a relatively small area, the Mons basin proposes a rich geo-heritage of minerals, rocks, fossils, outcrops and geological situations and phenomenon all of a very high pedagogical and scientific value (Fig. 2). At least thirty geo-sites are available for geo-education and geo-tourism. Some are already inscribed in the UNESCO World Heritage as for Spiennes and the Iguanodons of Bernissart. The “Malogne” underground quarries of phosphate chalk are themselves “Patrimoine exceptionnel de Wallonie” .

1. Geo-Education in the “La Malogne” association

From the beginning the foundation aims of our association are to develop scientific studies on the Mons basin and to support geo-education and geo-tourism through local or neighbouring sites (Fig. 3).The phosphate quarries are especially adapted for stratigraphic, palaeontological, tectonic, hydrogeological observations and exercises (Fig. 4) together with open sites in chalk, clay or sand pits, coal heaps and geothermal plant.

2. Human Impact on the landscapes in the Mons Basin Geopark

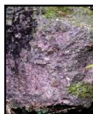
What is striking in the landscapes in the Mons area is the imprint of the humanisation. The landscapes of the Geopark, sprinkled with coal-heaps, memories of the coal mining times, strongly testify of the interdependence of the Man with the mineral resources. This close relationship is particularly engraved in the heritage of the Mons Basin, because the first mining activities began here 10 000 years ago in the flint mines of Spiennes. There, men have dug deep pits and galleries in the chalk in search of high quality flint banks needed on the surface by quasi industrial chopping and polishing workshops (Fig. 5). In addition to the direct extraction of the coal mining, the Industrial

Stones and minerals of the World, rare minerals, marbles.....

The Mons Basin Geopark
amongst the large
European geological
regions



Pairi Daiza
Stones of the
World



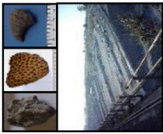
Lobbes
Old Red
Sandstone



Roisin
Caillou-qui-Bique
ORS



Abbaye d'Auine
La Tombe Massif



Soignies
Belgian
Bluestone



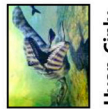
Waudrez
Silcrete quartzite



Harmignies
Cuesta in the
chalk



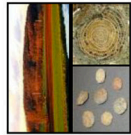
Bernissart
Iguanodons



Hyon-Cliply
La Malogne
underground
quarry
Mosasaurs



Erquelinnes
Champsosaurus



Mont Panisel
Nummulites



Spiennes
Neolithic flint
mines



Fraternies
PASS
Crachet



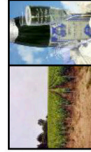
Binche
Ramparts
Saint-André chapel



La Louvière
Boat elevator-Meanders of
the Haine river



Saint-Ghislain
IDEA-Geothermal
plant



Haulchin
Agaises vineyard

Exceptional Fossil Geosites

Striking
(Géo)sites

UNESCO World Heritage Site



PASS : Parc d'Aventures
Scientifiques et de Société
IDEA : Intercommunale de Développement
Economic et d'Aménagement du Territoire

Fig.2 – Selection of major geo-sites of the Mons Basin Geopark according to the figure 1 and classified in four relevant categories each corresponding to a “à la carte” possible visit.



Fig.3 – Geo-education for children (two photos above). Fossil hunting on a coal heap on the left. Introduction to observation in the lab, on the right. Geo-education for adults (two photos below). Foreign field trips on the left. Natural Sciences courses in the Geology Department; people who follow this two years certificate may reach a "Guide Nature" degree.

Revolution also triggered the exploitation of diverse other raw material, phosphates, chalk, sands and clays, and also underground water. Without these exploitations, major discoveries did not happen. This is strikingly the case of the 29 iguanodons of Bernissart, find, contrary to all expectations, in a coal mine (Fig. 2). A similar situation happens with the Hainosaurs, a species of Mosasaurs extracted from the Maastrichtian phosphatic chalk (Fig. 4) and also for the Champsosaurs extracted from the Eocene sands of Erquelinnes (Fig. 2).

Even the earliest European mammals coming from « Montian » lacustrine marls were revealed thanks to hydrogeological research cores! Iguanodon is one of the first dinosaur named from a teeth found in the Isle of Wight. Bernissart specimens were the first entire dinosaur skeletons found. Before this discovery their reconstruction was fanciful (Godefroit, 2012).

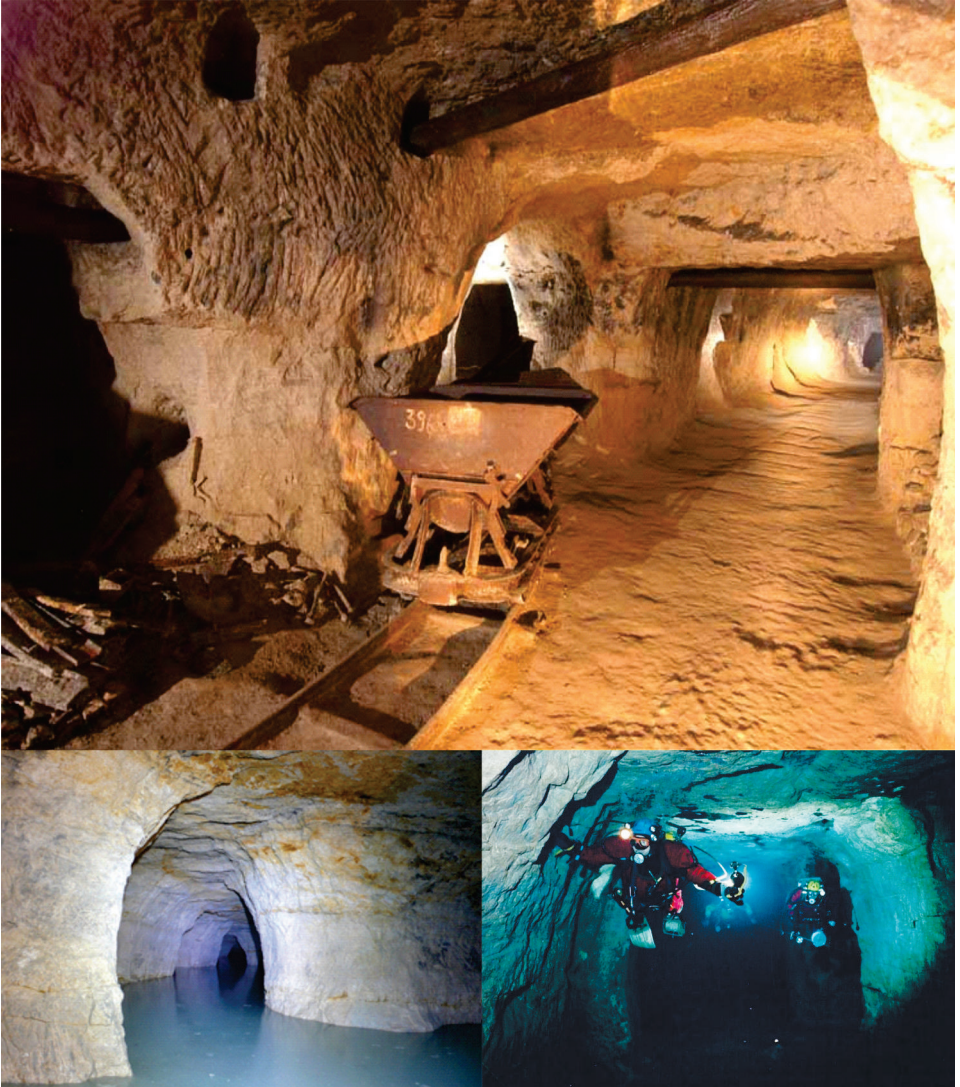


Fig.4 – “La Malogne” underground quarry as an example of the major geo-sites in the Mons Basin Geopark. Above, galleries of the underground quarries of the Craie Phosphatée (photo Focant above, Bastin below). Below left, downstream galleries reaching the water table. Below right, exploration of submerged galleries. “Patrimoine Exceptionnel de la Wallonie”.



Fig.5 – Neolithic flint mine of Spiennes. From top and clockwise, three steps of the making of a Neolithic polished axe, gallery near the entry showing the dug flint bed at the top of the walls, large view of the mine from where the flint concretions were extracted at the roof. (Photo: Focant left, Woodbury right).

3. Mons Basin aspiring Geopark

The Mons Basin Geoparc was initiated by « La Malogne » association, launched on 2009 and inaugurated by 2011, under the auspices of the University of Mons, with the support of the Walloon Region and associated with twenty districts of the Mons area that are interested in developing a scientific tourism. It was presented to the Belgian Royal Academy of Sciences and Arts by 2012. In 2013, six guide-books were published documenting the significant Geo- and Heritage-sites. They are currently distributed to the people in order to guide and accompany visitors. They also delineate our action and strengthen our aims towards the Mons Basin Geopark (Collectif, 2013). Last important step is the UNESCO expert inspection on July 14-16 2015. In addition, the Mons Basin Geopark abuts on the Northern France close to three neighbouring « Parcs Naturels » with which it is associated together with the « Conseil Scientifique du Nord-Pas-de-Calais ». Thanks to such a proximity, we participate in frequent trans-border exchanges and collaborations.

Not only Geosite and Heritage, the Mons Basin Geopark is an association of partners, museums and attraction/scientific parks (Pairi Daiza, PASS) which contributes to the scientific animation of a rich natural heritage.

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