BOOK REVIEW

QUINIF, Y. **Fantômes de roche et fantômisation. Essai sur un nouveau paradigme en karstogenèse**.
Karstologia Mémoires 18, 2010, 196 p., A4, full colour, copiously illustrated. Distribution: Faculté Polytechnique de Mons: bouqui@skynet.be or tel. 00 32 (0)65 374603.

'Fantômes de roche': this funny term refers to a new revolutionary concept of karst genesis. By extending the term to non-carbonaceous rocks, the author places karst formation as a particular case in a universal weathering process providing an explanation for singular landscape forms (Chapter 1) and placing karstification in the wider general geological evolution of a specific area. This compilation of 20 years of studies on ghost rocks is a major turn in the way we look at karst and in particular, cave formation.

Ghost rocks were described as such for the first time by Yves Quinif and co-workers from the Faculté Polytechnique de Mons in the quarry of Gaurain-Ramecroix (Carrière du milieu) (Chapter 1 and Chapters 2 and 3 for detailed descriptions of the petrography and morphology of ghost rocks).

Ghost rocks develop by the, often partial, dissolution of the carbonate, leaving what is called 'a ghost' in place. The ghost is composed of the residues left untouched in place, i.e. the insoluble material and the remaining carbonate. The result is a kind of 'rotten' limestone where the macroscopic structure of the limestone beds and some fossils are still visible but which can be crumbled by hand. This is also a '*ghostful'* nightmare for the quarries since the return on investments is rapidly decreasing. After lowering of the water table, percolating water can rapidly 'clean' the residues, forming a void or cave on a timescale of some months to some years, a process observed in-situ in the quarries.

This fundamental change in timescale, destabilizes our well-known traditional concepts of cave formation as described by Cvijić and further developed throughout the 20th century, where limestone is dissolved and progressively widens fractures and bedding planes until a paragenetic threshold when insoluble material can not anymore be evacuated from the walls and prevent further dissolution. The formation of caves takes thousands to millions of years. While classically, the formation of the nowadays Belgian caves was essentially situated during the Pliocene and the Quaternary, the author demonstrates that ghost rock formation in the Mons Basin took place during the Cretaceous before the Cenomanian and that during recent times (Quaternary) only the evacuation of the residues and some reshaping by inflowing water and/or rivers resulted in the nowadays well-known caves (Chapter 4). This new type of cave formation also makes terms such as upstream or downstream part of 'ghost caves' useless. The study suggests a more complex multi-phase formation of caves with phases of ghost rock formation and fluvial shaping of the galleries, from the Cretaceous until recent times, than previously thought (Chapters 7 and 8).

As well-demonstrated by the author, tectonic and paleogeography play a major role in ghost rock formation and thus in karstification. The new concept gives a credible explanation for several topics difficult to explain with the classical karstification theory such as the presence of caves in unexpected places and the presence of an alternation of small and wide passages often observed in several caves. It explains morphologies found in the granitic massif of the Sidobre in France, in the karstic regions of the Monte Bisbino in Italy or in the Grands Causses in France. It gives an explanation for the regular collapses in the Tournaisis Region (Belgium). The ghost rock concept also leads to new questions about the role of micro organisms in ghost rock formation and the exact (bio)geochemical processes going on during in-place limestone dissolution.

Since ghost rock formation seems to be a very strong karstification process, the question arises if it is not a requisite for the formation of all voluminous worldwide caves in limestone but also in non-carbonaceous caves such as the kilometres long quartzite caves in Venezuela for example. This question can only be answered by hunting and finding the ghosts in these caves, a major difficulty as explained in chapter 9.

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