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How to teach geocomplexity at two opposite levels? The “Klippen of Cabrières” case study (Hérault, France).

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The starting point of this essay is a question from a school teacher who came in contact with me via my photo gallery online. His question, "What is the origin of the Roc de Murviel?" actually covers three or four separate problems, and requires to devise simple and specific comparisons in order to help children of 8 years old to understand a bunch of difficult and abstract concepts. But, in contrast, Carboniferous marine sedimentary deposits of the so-called unit “Klippen of Cabrières” are known of geologists worldwide, due to the presence of a Global boundary Stratotype Section and Point (GSSP) located not far from the “Roc de Murviel”, the “La Serre” section, where is defined the base of the Carboniferous System, Mississippian Sub-System and Tournaisien Stage. In this case, to remind how the conceptions about the formation of the “Klippen of Cabrières” evolved may serve as an introduction to the explanation of syntectonic sedimentation and to the history of the concept of thrust nappe for the well-trained public as well as academics or engineers not experts in the specificities of regional geology. Difficulty (at least in France) will come from the scarcity of naturalists, a species in danger of extinction, and from the small number of historians concerned by the natural sciences.

At the public school, the first method is to decompose the problem into independent issues (Cartesian reductionism) such as: nature and age of the rock? mode of sedimentation? part of an ancient mountain chain? existence as a landform in the current landscape? Concerning the specific question of geological time, because most children of this age do not yet know how to read the time, a second method is to replace the model of the clock (the entire history of the planet Earth reduced to one year) by the metaphor of either the staircase or the ladder, both adapted from the international stratigraphic scale. A third method is to use the concept of "toolbox" for each sub-disciplines or specialties required: inorganic chemistry, paleontology, structural geology, geomorphology.

For the public of motivated adults, it may be helpful to remember the key milestones of one century of regional geology: first detailed geological mapping by Paul Gervais de Rouville in the 1870s, Jules Bergeron’s “nappe de recouvrement” inspired by the work of Marcel Bertrand in Provence and Switzerland, Bernard Gèze’s “nappe-pli couché” derived on Pierre Termier’s “nappe du premier genre” in the Alps, the widespread use of sedimentological and micro-tectonic criteria after Second World War (though formerly implemented by André Demay in the Cévennes before 1939), with the studies of Lamoraal Ulbo Sitter, Rodolphe Trümpy and John Rodgers in the 1950s up to those of Maurice Mattauer, François Proust and François Arthaud in the early 1970s. Regarding the teaching of geological time, the issue will be addressed ex situ with the help of the clock model defined above, and could be completed by fieldwork with the observation in situ of one of the real “bars” of the stratigraphic “ladder”, i.e. the GSSP’s of La Serre section. Two other points are situated nearby: the Coumiac quarry near Cessenon (base of the Famennian Stage) and the Col du Puech de la Suque (base of the Frasnian Stage and Upper Devonian Sub-System). Fieldwork is aimed to link the study of geodiversity to that of biodiversity, in addition to paleontology, paleogeography and the reconstruction of palaeoenvironments.