



CARBONATE BUILD-UPS - AN ELEMENTARY INTRODUCTION TO LIMESTONE SEDIMENTOLOGY

Clive Burrett¹

¹Palaeontological Research Centre, Mahasarakham University, Thailand
Email: cfburrett@gmail.com

ABSTRACT

Limestones are important as they occupy large areas of the earth's surface and are economically important in the petroleum, cement, construction, agricultural, engineering, water, tourist and engineering industries. The study of limey sediments and limestones has exploded in the last 60 years and reliable depositional models are now available for based on studies in tropical and sub-tropical regions in the Persian (Arabian) Gulf, the Caribbean, Indonesia, Australia and on temperate to glacial environments in Europe and southern Australia. The importance of cyanobacteria in constructing mats and stromatolites in peritidal to subtidal in both warm and cool environments is now realised (pgs. 26-33 in Excursion Guidebook)

The carbonate factory in shallow seas builds large limestone edifices and its 'workers' toil ceaselessly to extract CO₂ from the environment, construct limestone and keep up with rising sea-levels. The carbonate factory 'workers' in the Palaeozoic consist of cyanobacteria, calcareous algae, crinoids and other echinoderms, foraminifera (including fusulinids), corals, bryozoans, calcareous sponges (including stromatoporoids) and a wide variety of brachiopods, ostracods and molluscs (pgs. 21- 24). Coral reefs have been intensively studied in the Great Barrier Reef of NE Australia, the Caribbean, the Middle East and SE Asia. Palaeozoic coral-stromatoporoid-sponge reefs have been studied for example in Texas (Permian), Western Australia (Devonian) and Canada (Devonian) (pgs. 34-38). The carbonate factory in the shallow areas of carbonate platforms may spill-over the platform margins and form thin-medium bedded calciturbidites (or allodapic limestones) in deep water, basins such as the Elert Formation of Loei (p.41-49).

Two widely used classification schemes are available for limestones - one proposed by Folk and the other by Dunham (pgs. 11- 19).

Once deposited, carbonate sediments are subject to the many processes of early to late stage diagenesis that include compaction, stylolitization, cementation and dolomitization (p. 7-10). Dolomites may form in saline environments in sabkha environments or later in warm to hydrothermal subsurface environments. Dolomitization may obliterate or enhance limestone textures. Complete dolomitization leads to elephant-skin weathered dolostones. Dolomites may be replaced by calcite during dedolomitization.

During burial, limestones undergo a host of diagenetic changes which grade gradually into recrystallisation, metamorphic alterations and conversion to marble. Modern techniques are used to assess thermal maturity of limestones and include the progressive conversion of light coloured organic-walled palynomorphs (spores, pollen, chitinozoans, dinoflagellates etc) to black and at higher temperatures conodonts from amber to black to glass clear (pgs. 10-11). Most Palaeozoic limestones in Thailand were affected by burial temperatures of between 200⁰

C and 300°C and are therefore mainly in the gas window. However, some areas close to intrusions have enjoyed much higher contact metamorphic temperatures.