



The petrographic description of carbonate facies: are we all speaking the same language?

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Despite the proposition of a number of alternatives, the Dunham Classification System has survived to become the most widely-adopted scheme for the petrographic description of carbonate sedimentary rocks. Both academia and industry require consistent and repeatable carbonate lithofacies classifications as a primary input to depositional, diagenetic and reservoir models, and the Dunham System has long been held to satisfy this requirement. However, despite a perceived clarity in the definitions employed within the Dunham System (along with subsequent modifications), ambiguities in the petrographic description of thin sections are widespread.

This study has investigated the consistency of the use of the Dunham System across academia and industry at a wide range of experience levels in order to quantitatively assess reproducibility in the petrographic description of carbonate sediments at thin section scale.

Phase one of the study was undertaken in order to assess the validity of the project and establish a procedure for a wider sampling strategy. A selection of synthetic carbonate thin sections were produced using strictly controlled component ratios and at a range of sedimentary textures spanning the Dunham Classification System. All samples were subjected to modal analysis and petrographic images of the samples were obtained. Volunteers, from both industry and academia, were randomly allocated either blind-labelled thin sections or photomicrographs and asked to describe the samples. Volunteers were also asked to complete a questionnaire detailing their background. This stage of the study established that the use of thin sections or photomicrographs did not make any perceivable difference to classification.

In order to assess the applicability of the results of phase one to genuine carbonate samples, phase two of the study employed a set of fourteen carbonate thin sections derived from a range of Mesozoic and Cenozoic age carbonate lithologies. These thin sections were also subjected to modal analysis and were imaged at a range of magnifications. The images were integrated into an on-line questionnaire and an open invitation was made to the geological community to classify the thin sections and complete the associated background questions.

The results of the completed surveys were tabulated and analysed in order to assess consistency and reproducibility in the petrographic description of carbonate rocks. Ambiguities were documented and analysed to constrain areas of uncertainty in the application of the Dunham Classification System. Based upon the findings of these data, clarifications to the Dunham System are proposed.