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Title: ***Do Cincinnatian (Ordovician) Phosphorites Result from Intrinsic Organic Burial Processes or Extrinsic Conditions?***

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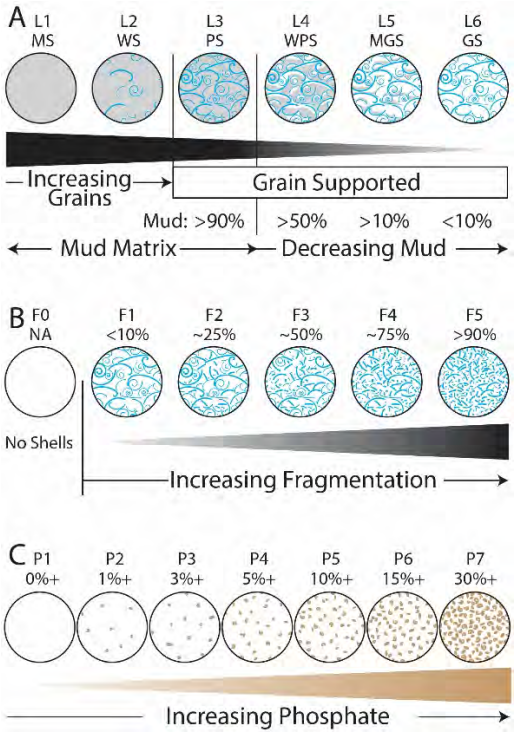
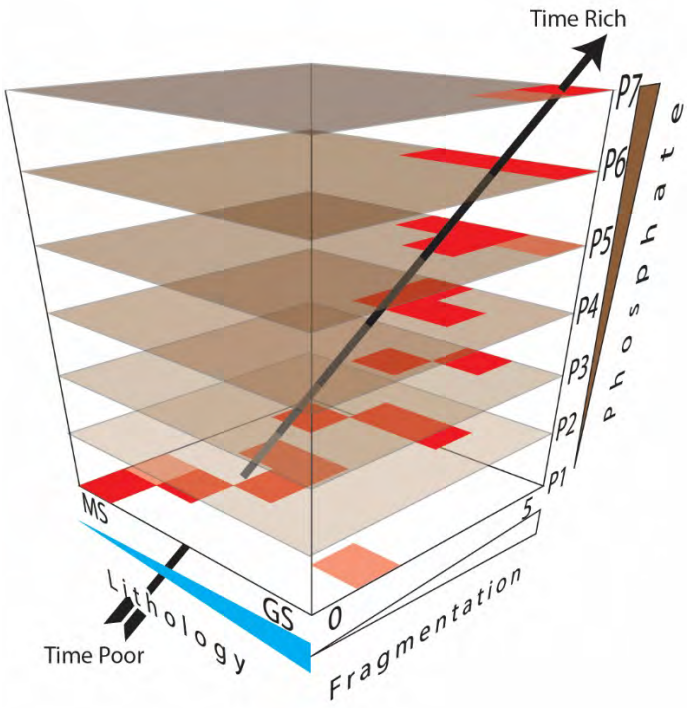
General results

This year we have concentrated efforts on petrographic analysis to determine what factors are correlated with variation of the content of phosphatic steinkerns in sediments. The results solidify the connection between carbonate maturity and the buildup of phosphatic micromolds. Phosphate takes a long time to precipitate and the correction between signs of maturity and phosphate enrichment suggests that shell bed maturity is in fact a result of time richness.



Two measures of textural maturity are the Dunham carbonate classification which marks increasing grain support and decreasing mud content, and degree of fragmentation. Phosphate accumulation is likely to be a sign of



By classifying 260 shell-limestone thin sections by their lithology, fragmentation, and phosphatic content, were demonstrated that the three measures are highly correlated. In this stacked diagram the red squares are higher-than-expected thin section occurrences.

Based on the relationship established between textural maturity and phosphate content in mixed carbonate systems of the Cincinnati Ordovician, we predict that any shell bed sediments that exhibit condensation under the right right geochemical conditions should also contain small phosphatic steinkerns. The Triassic Muschelkalk of Germany is similar sedimentologically to the Cincinnatian, but small phosphatic steinkerns had not previously been reported. We predicted that they would be found, and in an opportunity to visit Germany we were able to obtain several samples that did indeed turn out

to contain these phosphatic micromolds. This demonstrates that the Cincinnati model may be may apply to other basins and times.

Impact on Students

The Geology department at Purdue Fort Wayne was closed as part of restructuring. PRF student support was important for helping the last group of geology students to focus on the sciences and move forward under difficult circumstances. There were six student presentations at professional meetings.

Mason Frauhiger presented the Muschelkalk work at the Fall 2018 GSA. A graduate who was formerly supported by PRF , he is locally employed in a consulting firm and continues to work on the research

Amanda Hartstein was involved in a number of scientific presentations and has contributed significantly to a paper in preparation thanks to her PRF support. She is making good progress to a degree.

Stoller graduated with a BS. His goal is to work as a vertebrate paleontologist. He is currently a museum technician at the Museum of Paleontology, Department of Earth and Environmental Sciences, University of Michigan. His experience working under PRF support was a significant part of his portfolio.

Nicholas Miller's primary interest is in archeology. The He is currently in graduate school in Archeology at Ball State University

Impact on PIs Career

As a result of this PRF funded project, the PI has developed a reputation and name recognition among Cambrian workers (who are very interested in phosphatic micromolds of fossils) globally. Several additional papers and further grant proposals are in preparation as a spin-off of this work.