Brachiopod Shell Beds as Indicators and Predictors of Ancient Hydrocarbon Seeps: Assessing their Geological, Paleoecological, Evolutionary and Biostratigraphical Significance

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Cretaceous-age brachiopods (135 million years ago) referred to the genus *Peregrinella* (figure on left) - from France (top row) and California (bottom row) in the collections of the United States National Museum, Smithsonian Institution. This is one of the largest-sized rhynchonellid brachiopods during the 440+ million year history of the Order Rhynchonellida, reaching over 10 cm in width and length. The brachiopods from California have previously been reported as from ancient hydrocarbon seeps.



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Peregrinella from Romania (left) occurs in mass-abundance in carbonate blocks that are newly interpreted as fragments of chemosynthesis-based environments developed around hydrocarbon (methane) seeps.

These carbonate blocks (left), as well as contemporaneous transported isolated *Peregrinella* specimens (right, top) occur in sandy clastic turbidites of the Sinaia Formation, Eastern Carpathian Mountains, Romania (right, bottom).

The research provides an alternative paleoecological model to one previously proposed (that these brachiopods lived in rocky shorelines that are never preserved). The brachiopods and enclosing sediment confirm intrabasinal methane seeps and subsequent redistribution by turbidity currents.



