SEPM Research Conference on Autogenic Dynamics of Sedimentary Systems

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Summary

On August 3-6, 2014 over 50 enthusiastic scientists gathered in Grand Junction, CO, to discuss autogenic dynamics in sedimentary systems. A broad range of disciplines was represented by experts in geomorphology and ecology along with sedimentologists and stratigraphers focused on carbonate, clastic, and diagenetic systems. Generous support from SEPM and ExxonMobil subsidized costs for more than 15 graduate-student participants, helping to promote up-and-coming perspectives alongside those of established scientists from industry and academia.

Over two and a half days, participants shared talks and posters on approaches to studying and evaluating autogenic dynamics and self-organization in sedimentary and ecological systems.

Keynote talks focused on how autogenic dynamics are manifested and detected in biological (Johann von de Koppel and Tom Olszewski), geomorphic (Laurel Larsen), diagenetic (Enrique Merino), clastic (Chris Paola), and carbonate (Peter Burgess) systems. Martin Perlmutter also provided an overview of how autogenic dynamics are being incorporated into modeling and subsurface prediction in industry.

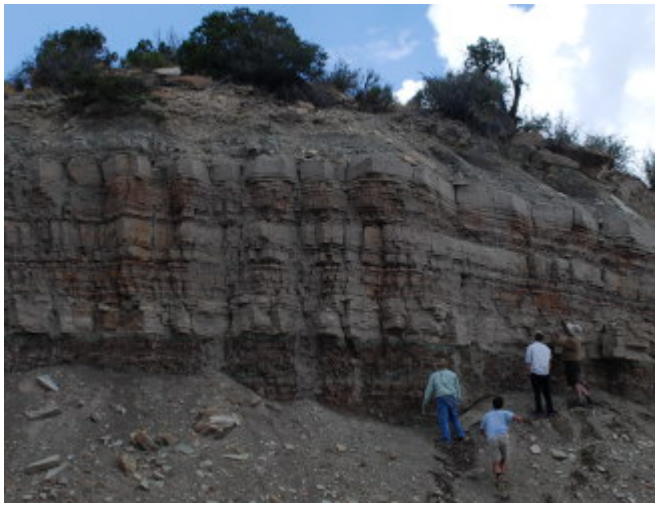
Other participants presented a wide variety of cutting-edge experimental, numerical, and field research on contemporary and ancient autogenic processes and their sedimentary products.

Some common themes in those presentations included: correlation of specific autogenic processes to specific stratigraphic patterns and responses; roles of landscape dynamics and sediment storage and release as autogenic drivers; clustering of fluvial channels; autogenic vs. allogenic shoreline dynamics; the filtering of stratigraphic records by both autogenic and allogenic processes; signal shredding by autogenic processes; the strong autogenic signal of biogenic deposits and the possibility of biogenic shredding of allogenic

signals; and the potential for a number of mathematical and statistical tools to identify and model both autogenic and self-organized stratigraphic signals.

Daily discussions revealed several outstanding questions and opportunities identified by conference participants. One common question was how do we define autogenic and self-organized systems? The answer is fairly narrow and clear in fields such as biology, physics, and chemistry (i.e., systems where disequilibrium and positive feedbacks exist, resulting in new behaviors spontaneously emerging from the interaction of components of the system), but no so straightforward where stratigraphers, often aiming to interpret past climate or tectonic changes from the sedimentary record, sometimes consider "autogenic" deposits those that cannot clearly be connected to, for example, a change in basin boundary conditions.

This difference in aim and usage sparked much discussion throughout the meeting. Related issues included distinguishing autogenic from allogenic products in a greater range of depositional settings (most work currently related to fluvial, deltaic, and eolian systems), and defining the characteristic time and spatial scales of autogenic processes and strata.



A number of workers suggested autogenic processes should be the default interpretation of sedimentary records, with that null hypothesis evaluated with more robust field tests (including statistical methods). The salient point is that allogenic processes have, to date, perhaps been taken as the go-to control on the accumulation of strata when autogenic forcing might offer an equally reasonable interpretation.

Another common theme was how to link insights from experimental and numerical models to field data and vice versa. This is a non-trivial challenge, but participants viewed opportunities for self-consistent scaling comparisons and statistical descriptions of processes and strata as promising avenues for making progress on this front. Reduced complexity and automata modeling and experimentation in more types of sedimentary analogs were also judged fruitful avenues of research.

As part of a final plenary discussion, participants shared action items they intended to take away and implement after the meeting.

These included re-examining field data from new perspectives, reading more broadly outside their main disciplines, writing papers with broader audiences in mind, working to clarify the scope and boundaries of their studies, trying new methods of data collection and analysis, developing new interdisciplinary collaborations with other researchers, and training students more broadly, including developing exercises to introduce undergraduates to the concept of autogenic dynamics in sedimentary environments