



## Canadian Sedimentology Research Group: Third Regional Meeting

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with a contribution by

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When the CSRG held its third Regional Meeting, 24-26 May 1989, at the University of Ottawa, I felt that this gathering was indeed here to stay. In keeping with the "traditional" format, the meeting opened with a choice of two field trips, held on 24 May. The fates smiled and the sun shone — well, at least it didn't rain!

Andre Desrochers, Terry Sami, Al Donaldson and Lawrence Bernstein led a group of about 28 to look at a variety of Lower Paleozoic rocks in the Ottawa area. The first roadside stop showed exposed Lower Ordovician (Beekmantown Group) inter- to sub-tidal dolostones and limestones, including some unusual micro-digitate stromatolites. The next section revealed the "Knox unconformity" between the Beekmantown and Chazy groups. In this quarry section, cross-bedded sandstones of the Chazy Group rest abruptly and disconformably on Beekmantown Group dolostones: the lack of boring and scalloped relief suggested a karstic origin for the surface. The third stop, in Hog's Back Park in Ottawa, showed a variety of fine-grained clastic and carbonate rocks of the Lower Chazy Group, Rockcliffe Formation, exposed in the banks of the Rideau River. Of particular interest here were a series of siltstone units, each capped by a burrowed calcareous hardground, veneered with bioclastic, phosphatic debris. Evidence that these sediments had been subaerially exposed periodically was provided by occasional laminae of frosted ?eolian quartz grains, calcite pseudomorphs after anhydrite, flat-pebble conglomerates and rare

desiccation cracks. Fine-grained HCS (hummocky cross-stratified) sandstones at the same locality contained evidence for early submarine lithification, and runzel marks — evidently *not* an emergence indicator in this example! Terry Sami illustrated a variety of sub- to inter- and supra-tidal carbonate facies in a well-exposed section on Riverside Drive. For the bug-lovers, this section contained beautifully preserved fossils, notably stromatoporoids, bryozoa, crinoids and ostracods. We all took turns to peer over the fence guarding the new Scott Street bus transitway to admire a superb, but unfortunately inaccessible, bedding-plane exposure of huge stromatolites which, Al Donaldson tried to persuade us, showed a marked northerly elongation. Crossing the river, the group examined storm-influence biosparite and biomicrites along the Lac des Fees parkway. Large, stromatoporoid-encrusted intraclasts, undercut erosional scours and well-developed swaley cross-stratification provided good evidence of both penecontemporaneous cementation and major storms. After all this excitement, the party proceeded to refresh body and soul from the well-stocked cooler in the van. Suitably fortified, we returned to see the Coburg Formation exposed in the banks of the Ottawa River near Nepean Point. There, mudstones with interbedded calcarenites and calcirudites were interpreted as storm beds. As a final tidbit, Andre Desrochers led us to piles of black shale dumped by the riverside. This material was from the rarely exposed Lower Billings Formation, and, to our surprise, yielded myriad trilobites, some of which exceeded 30 cm in length! With pockets bulging and suitably impressed, we returned to the Ottawa U campus.

John Shaw (Queen's U) participated in the second field trip, and his impression of the day is set forth below.

Participants on the Pleistocene field trip, led by Brian Rust and George Gorrell, were treated to spectacular exposures in the now classical area for "subaqueous outwash" fans. The Redmond pit at Loughlin Ridge, near Kemptville, displayed proximal gravel facies, passing distally into thick units of diffusely graded sand. Large faults indicated deposition in the ice-contact environment. Simply writing that down gives the impression that all was as it should be, and, yes, we've certainly got the old subaqueous fan model sorted out. On the contrary, bemused bewilderment was the overwhelming response from the group of seasoned (some more than others) and esteemed sedimentologists faced with beautifully rounded boulders in a sand matrix, overlain by polymodal, chaotically bedded gravel and passing distally, over a lateral distance of about 50 metres, into thick, apparently massive or diffusely graded sand units. To add to the excitement, the graded sand was seen to fill scours, with near-vertical sides, cut into

sand showing all manner of soft-sediment deformation. Finally, the thought of rip-up slabs, several metres long, of unconsolidated silt and sand "floating" in the graded sand, led several graduate students to contemplate a career in theology; Grant Young to declare that the Proterozoic was much simpler; and Geoff Burbidge and Dave Sharp to the conclusion that, since we don't understand the wood, we had better look at some trees — they went out the following day to collect samples to do grain fabrics. In blissful ignorance, we ate a huge lunch and drank lots of wine to ensure that our powers of imagination were up to the challenges of the next two sites, the famous Brazeau pit and the less well-known Drummond pit at Nepean. Sure enough, what we saw was much the same as at the Redmond pit. This left us well satisfied that the facies model devised in the morning was already an established sedimentological law by the afternoon! A concerted effort by Rick Cheel got Dale Leckie to admit that perhaps, just maybe, some bedding that looked like HCS might be caused by standing waves in a unidirectional flow. They are going to do some grain fabric work and think about the problem. A thick diamicton cap forms a distinct feature of the Drummond pit, but attempts by your correspondent to generate discussion on the ice advance deposits *versus* subaqueous debris-flows were met by low mutterings from which a keen ear might have picked out "if you've seen one diamicton, you've seen them all". On that high note, we returned to Ottawa U; some to drink and ponder the wonders of the day, and some just to drink.

Oral presentations began at 9:40 the following morning after a brief welcome from the Ottawa-Carleton Geoscience Centre (OCGC) Chairman Keith Bell and convenor Geoff Burbidge. Dale Leckie (ISPG-Calgary) opened with a keynote discussion of his recent work on Lower Cretaceous organic-rich marine shales in Alberta. Using extensive subsurface and outcrop data, Dale demonstrated the presence of a regional unconformity cut into the Cadotte Formation during sea level low-stand, and then related the geochemistry, mineralogy and biotic content of the overlying shales to various stages in the ensuing marine transgression. Dipping briefly into the Paleozoic, Dave McLean (McGill U) gave a spirited exposé of his work on Upper Devonian reef and basin sequences in the central Rocky Mountains where huge cliff-sections gave spectacular views of interdigitating reef and off-reef lithologies. Returning to the Upper Cretaceous, Guy Plint (UWO) presented evidence for high-frequency eustatic cycles which resulted in several episodes of rapid shoreline progradation. Progradational events appeared to be spaced about 100,000 years apart, prompting speculation that sea levels were reflecting a Milankovitch-scale glacio-eustatic control.

Scott Hadley (McMaster U) described how he had been able to develop a detailed event-stratigraphy for the Lower Cretaceous Viking Formation in the Harmattan Field, in which a package of prograding shoreface and coastal plain strata were overlain by a series of transgressive packages, separated by thin pebble beds. The morning session was rounded off by Jennifer Wadsworth (McMaster U) who discussed her continuing struggle to understand the morphology and genesis of a regional sequence-bounding unconformity. Her results could have important implications for both the eustatic and tectonic history of the Alberta Basin.

Following a leisurely lunch, the afternoon session began with a thought-provoking keynote address by Grant Young (UWO) on the ultimate causes of glaciation. After reviewing evidence from all the main ice ages, Grant concluded that it was the overall configuration of the continental plates that triggered ice ages (except the Pleistocene): either during the initial stages of rifting of a supercontinent, or during periods of "super-continental" still on a glacial theme, Rob Delorme (U Waterloo) described his recent work on subaquatic outwash in bedrock-controlled terrain in the Ullswater area of Ontario, and John Devaney (OCGC) recounted, with spectacular photographs, his "close encounter" with a real, live, alluvial fan flood surge on Ellesmere Island. Switching back to the Paleozoic, Al Donaldson (OCGC) illustrated a stromatolite bed in the Pamela Formation that was well exposed in plain view on the banks of the Ottawa River. The pronounced elongation of the stromatolites was used to infer the orientation of the paleo-shoreline. Fueled by morning coffee and doughnuts, the session resumed with a presentation by Brian Rust (OCGC) in which he illustrated some convincing 3-D antidunes from the Westphalian of Cape Breton, and then went on to point out the disturbing similarity of these structures to the HCS we all know and love. Moving to an even finer level of detail, Rick Cheel (Brock U) gave a very lucid and well-illustrated account of his painstaking investigation of grain fabric and grading in individual laminae in HCS sandstones. Rick was able to show that unidirectional and oscillatory currents could be identified from grain orientation, and used this information to reconstruct shelf hydrodynamics during an individual storm. Bob Dalrymple (Queen's U) showed how he had converted a lobster boat into an oceanographic research vessel with which he had conducted a pioneer seismic study of the structure of a tidal sand-bar complex in the Bay of Fundy. Bob felt that he could recognize a new type of large-scale accretionary surface within the complex, but was also careful not to show any uninterpreted seismic lines! Mike Byerley (Waterloo) brought the session to a close with a beautifully illustrated presentation of his work on the

ichnology and sedimentology of the Georgian Bay Formation on Manitoulin Island, which he interpreted as a storm-dominated, mixed carbonate shelf.

The Friday morning session was opened with a keynote address by Claude Hillaire-Marcel (UQAM) in which he presented what amounted to a mini short-course on disequilibrium in uranium and thorium families, and the way in which they could be employed to solve a variety of geological problems. In particular, Claude emphasized the value of U/Th ratios in the recognition and dating of paleosols, and in the estimation of sedimentation rates in deep-sea sediments. Andre Desrocher (OCGC) transported us to the Wrangellia Terrane of British Columbia where he had been working on a sequence of Upper Triassic carbonate platform deposits. Andre was able to recognize a series of small-scale shallowing-up sequences, each capped by a vadose pisolite, indicative of periodic ?? eustatic sea level fall and exposure. Randy Rice (OGS) brought us nearer to home with an account of his work on the sedimentology and stratigraphy of the Lorraine Formation of the Cobalt Group in northern Ontario. Hindered by poor exposure and few diagnostic sedimentary structures, Randy felt that the massive quartz arenites of the Lorraine represented a marine shelf deposit, although the evidence was far from conclusive.

After morning coffee and perusal of the nine poster displays, we resumed to hear Kathy Middleton (Waterloo) describe her current work on the diagenesis of Middle Ordovician carbonate reservoirs in southwestern Ontario. To wrap up the morning, Pierre-Andre Bourque (Laval) described, in inimitable style, his investigation of that long-standing geological enigma — stromatolites. Pierre-Andre demonstrated that sponges had been a major factor in the genesis of this structure, yet in most cases were very hard to recognize. Cementation of the lime mud matrix took place very early, enabling shelter cavities to develop as the sponges decayed. Bacteria may have been important in the process by raising the pH in the mud mound, thereby accelerating the precipitation of calcite spar within the cavities: voilà — stromatolites!

After lunch, CSRG Chairman Bob Dalrymple convened the short CSRG business meeting. Amongst the items raised, Rick Cheel volunteered to host the 1990 regional meeting at Brock University in St. Catharines, Ontario, on 23-25 May.

Returning to geology, Al Donaldson (OCGC) took the floor again with an enigmatic observation: a huge block of Grenville gneiss overlying horizontal Ordovician strata near Marmora, Ontario. The foliation in the gneiss block was parallel to that in nearby *in situ* outcrops. Various explanations involving downslope slip on an ice surface, and glacial transport were suggested. Gerry Ross

(ISPG) described his work on terrane tectonics, basin analysis and detrital zircon geochronology from Mesozoic rocks in the Canadian Cordillera. Still in the west, Gary Yeo (Acadia) illustrated some unusual deep-water phosphorites, ironstones and secondary phosphates from mid-Cretaceous flysch sediments of Blow Trough in the northern Yukon. Greg Browne (UWO) presented detailed analyses of paleocurrents and structural elements in the Westphalian Boss Point Formation of southern New Brunswick. His findings suggested that fluvial paleoflow directions had been markedly influenced by syn-depositional movement on fault-blocks. Finally, Derek Armstrong (OGS) reviewed current research and mapping projects under way by the staff of the Ontario Geological Survey.

Nine poster displays were also on show. Those by Mike Byerly, Rick Cheel, Bob Dalrymple, Dale Leckie and Guy Plint were "hard copy" illustrations of their oral papers. Tim De Freitas (OCGC) illustrated his work on Silurian slope carbonates from the Arctic Islands: these rocks included some spectacular soft-sediment deformation structures. Bruce Hart (UWO) presented his ideas on the tectonic, eustatic and climatic controls that appear to have controlled deposition of the Cardium Formation, in particular the conglomerates, in NE British Columbia and adjacent Alberta. Jennifer McKay (UWO) presented preliminary results from her study of geochemical changes across ?subaerial sequence boundaries in the Cretaceous of the Alberta Basin, and Hans Meyn (MNDM, Bancroft) illustrated some badly cooked sediments observed during his recent work on the Belmont Lake Formation of Ontario.

In short, an excellent meeting. The standard of presentation, good at recent meetings at UWO and Queen's U, seemed even better this time, and was certainly equal to, and frequently better than, that at national meetings. Perhaps the quality of the oral presentations may be attributed to the small audience (about 60) and relaxed atmosphere, whereas the high standard of the science may reflect the fact that speakers are all too aware that they are addressing a knowledgeable audience which is unlikely to let unbridled speculation and unsupported data slip by easily!

Geoff Burbidge, together with his band of assistants, must be congratulated for staging a very smoothly run conference, both on the intellectual, and social fronts. Thanks for all your work!