



Canadian Tectonics Group

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The Canadian Tectonics Group met in Thunder Bay from 16-18 October 1987 for a day of talks and poster displays followed by a day on the rocks of the Archean Quetico Belt. Our host and convenor was Graham Borradaile of the Department of Geology at Lakehead University.

As is usual at such meetings, the talks and posters covered a fascinating variety of topics and localities. The Saturday morning session focussed on shear zones from Australia to the Appalachians and numerous parts of the Canadian Shield. In the afternoon, magnetic properties of deformed rocks, relationships between fold geometry and strain, piezochemistry and thrust faults were discussed. Concurrent poster displays illustrated tectonic research from New Mexico to Quebec and several experimental studies. Demonstrations of structural computer programs and experimental rock deformation were made.

Saturday morning, Chris Mawer from the University of New Mexico (UNM) described polyphase structures and reactivated mylonite zones of the Proterozoic Arunta Complex in central Australia where mylonitization occurred during tightening of major folds. Subhas Tella and I. Annesley (Geological Survey of Canada (GSC), Ottawa) discussed the 5 km thick Hanbury Island Shear Zone along the northwest shore of Hudson Bay and its relationships to other large shear zones of the region. Their current working hypotheses suggest that it was a deformed remnant of a deep-seated ductile late Archean thrust. Simon Hammer (GSC, Ottawa) talked about his work on the Great Slave Lake and Thelon tectonic zones, and their integration into one major suture formed during oblique convergence, collision and indentation of the Slave Craton. Changing scale drastically, Colleen Elliot from the University of New Brunswick (UNB) illustrated the relationships between gold mineralization in the Hemlo camp of northwestern Ontario, and polyphase folding and dextral shear zones.

The second session on Saturday morning began with a study of Proterozoic wrench faulting in the northern Labrador Trough by Norm Goulet, F. Falardeau and C. Hamel, which showed that these zones may be reactivated thrust faults. Bruno Lafrance and Paul Williams of UNB presented significant revisions of north-central Newfoundland geology in their description of the Boones Point Complex as a *mélange* belt (as opposed to a debris flow) that formed during Silurian continental collision. Moving into the brittle regime, Bob Stesky (Erindale Campus, U of Toronto) spoke of a fracture set near Lake Nipissing that may have formed by lateral spreading of crust thickened during the Grenville Orogeny. Movement on this set occurred during the Late Cambrian and the Mesozoic. Paula McKinnon and Paul Clifford (McMaster U) described complex sets of en echelon fractures in plutons of the Killarney Complex near Georgian Bay, Ontario that may have both shear and dilatant origins. The morning session concluded with Jacob deRoos's iconoclastic interpretation of mineralization at the Elura Mine, New South Wales, as formed by funnelling of regional fluids during deformation, with metamorphism concentrating metalliferous solutions in structural traps (vertical sheath folds).

Graham Borradaile led off the first afternoon session discussing relationships between strain and magnetic susceptibility both in nature and in laboratory experiments. A magnetic ellipsoid can be thought of as a sort of strain ellipsoid with minimum susceptibility coinciding with the pole to cleavage. Bill Pearce and Frank Fueten (Erindale Campus, U of Toronto) applied these studies to amphibolite layers in gneiss of the Thompson Belt of northern Manitoba, finding that the magnetic fabric agrees well in orientation with fold axial planar foliation and gneissic inclination. Paul Williams and Graham Price (UNB) discussed their experiments in deforming artificial schists by simple shear. Deformation occurred by slip on S_1 , bulk flattening, kinkband formation and slip on renulation surfaces. This work provided a model for development of axial plane cleavage after initiation of folding and indicates that strainband cleavage is a feature of transpressive ductile faulting. Craig Jowett and Pierre-Y. Robin (Erindale Campus, U of Toronto) derived an empirical statistical test to test the significance of point clusters using a continuous sampling function. Sandra Simidgian and John Starkey (U of Western Ontario (UWO)) studied fabric variation with quartz c-axes in heterogeneously deformed pebbles.

The final session was an interesting grab-bag of structural studies, beginning with some controversial piezochemical models by Brian Bayly from Rensselaer Polytechnical Institute, New York, followed by Peter Huddleston and L. Lan (U of Minnesota) who discussed finite-element models of folding of

viscous fluids and its relationships to rheology and wavelength/thickness ratio. Jack and Mariette Henderson (GSC, Ottawa) and Tom Wright (NSF, Washington) described their strain studies in the Meguma Group, Nova Scotia, using dewatering pipes, sand volcanoes and worm tubes as strain indicators. Originally vertical tubes were affected by layer-parallel shortening and pressure solution slaty cleavage, followed by bedding parallel shear during folding. Philip Simony (U of Calgary) compared folds at the termination of two thrust faults in the Alberta Rockies with angular fault-propagation fold models. He showed that contrary to the model, faults propagate into the core of the hanging-wall anticline, the ramp angle is larger, the interlimb angle is smaller and the back-limb dip is larger than predicted. To conclude the session, Don Rousell of Laurentian University spoke about the geometry and origin of reclined "similar" folds in mylonite of the Grenville Front.

The group adjourned for drinks, discussion and a look at the posters. Manfred Kehlenbeck and Barbara Seemayer (Lakehead U) illustrated their work on a fault-bounded outlier of Archean clastic rocks and its relations to an older volcanic terrane. Jeff Grambling, Mike Williams and Chris Mawer (U of New Mexico) described some new lithotectonic terranes in a Proterozoic metamorphic belt in New Mexico, stressing the probability that large-scale horizontal imbrication along major ductile thrusts could be common in the early history of such belts. Bob Bauer (U of Missouri) showed the polyphase structural history of the northern Vermillion granitic complex in northeastern Minnesota and Leo Nadeau (Carleton U) described the internal structural architecture of the Central Gneiss Belt of the southwestern Grenville Province. Paul Budkewitsch (Erindale Campus, U of Toronto) reported on his study of fault and fold styles at the base of the Chukokat Group on the Ungava Trough, New Quebec, and Owen Steele and Graham Borradaile (Lakehead U) described their experiments on pressure solution.

On Sunday, which began sunny but ended up cold and windy, we toured the Quetico and Wabigoon Subprovinces northwest of Thunder Bay, beginning with Proterozoic strata at Kakabeka Falls lying unconformably on the Archean. We stood on deformed pillow lavas (circa 2900-2730 Ma), younger Archean intertidal clastics (circa 2690 Ma) and Quetico gneisses (likely pre- and post-sediments) and discussion ensued about structural and stratigraphic facies and the complex fold geometries which were well exposed in road cuts. A tantalizing sampling of the intriguing problems of greenstone belt tectonics and a good ending to a fine meeting. Next year's meeting will be in Banff, Alberta, hosted by Philip Simony and Andrew Okulitch (GSC, Calgary), in mid-October, 1988.

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