

THE VICTORIAN GEOLOGIST



August 2010

THE GEOLOGICAL SOCIETY OF AUSTRALIA
Victoria Division

Next General Meeting for 2010

Thursday 29th July at 6:15 p.m.

South-directed oroclinal folding in the Lachlan Fold Belt: unravelling Mid-Late Silurian fold belt assembly to solve apparent Ordovician–Early Silurian complexity

Ross Cayley
Geoscience Victoria

Fritz-Loewe Theatre, Earth Sciences Building, The University of Melbourne
Preceded at 5:30 p.m. by drinks and nibbles in the tea-room, 4th floor. Cost \$2

Recent models for the Lachlan Fold Belt (LFB) attribute geometry (vergence changes between west, central and eastern portions), sedimentary relationships, width and magmatic history to several coeval subduction zones of opposing polarity, or to large-scale horizontal movement along the mid- to Late Silurian Baragwanath Transform. Aeromagnetic data shows that the Baragwanath Transform does not occur in western New South Wales, but there remains compelling evidence that the Tabberabbera Zone was not contiguous with the Melbourne Zone until the Early Devonian.

The model presented here provides a solution that involves mid- to Late Silurian oroclinal folding adjacent to dextral strike-slip faults. This solves the geometrical puzzle and apparent great width of the LFB, and simplifies its Late Cambrian–Early Silurian configuration, allowing closer ties with the Ross Orogen along the east Gondwana margin.

Continued on next page...

TALK DETAILS

Abstract (continued)

At the onset of the Late Ordovician Benambran Orogeny, Tasmania and the Selwyn Block are located outboard of the Gondwana margin, separated by the undeformed proto-Bendigo Zone ocean basin. A continent-directed subduction system was active along the entire eastern edge of the LFB. The Benambran Orogeny involved west-directed accretion associated with ongoing subduction that produced predominantly east-verging structures in the adjacent accretionary complex, including the Mallacoota Zone and Tabberabbera Zone. The Bendigo Zone, then along strike from the Tabberabbera Zone, was separated from subduction–accretion by the Selwyn Block.

The Late Silurian Bindian Orogeny marked the beginning of an interval where the evolution of the Lachlan and Ross orogens were markedly different. Bindian Orogeny movements in the LFB were south-directed and reminiscent of lateral escape tectonics, possibly in response to the southward movement of the Thompson Fold Belt. The LFB became progressively fragmented, with one portion, the western LFB, including the Selwyn Block, remaining attached to the Gondwana margin, protected from south-directed movements behind the broad promontory of the Curnamona Craton. A para-autochthonous portion—the Tabberabbera Zone, Hay-Booligal Zone and northern Stawell Zone—was peeled away from the Delamerian margin and oroclinally folded. An allochthonous portion comprising much of the central and eastern LFB, Wagga-Omeo Metamorphic Complex, and Macquarie Arc, detached from the margin and moved south along major strike-slip faults.

The main fault may be the Kiewa-Kancoona Fault System, interpreted to underlie the Bootheragandra Fault in NSW. This dextral strike-slip fault system initiated in northern NSW and propagated southeast, cutting across the Stawell Zone into the interior of the Lachlan Orogen. Faulting was focussed into the hot weak back-arc west of the Macquarie Arc: the Wagga-Omeo Metamorphic Complex. As the Kiewa-Kancoona Fault cut across the arc it began to founder in low-grade forearc terranes (Tabberabbera and Mallacoota zones). Instead these regions deformed by oroclinal folding.

The Selwyn Block and the Macquarie Arc acted as rigid indentors. Their oblique convergence during the Bindian Orogeny controlled the locus of oroclinal folding of intervening zones. As the Macquarie Arc moved southeast past the Selwyn Block along the Kiewa-Kancoona Fault System, the Tabberabbera Zone underwent more than 90° clockwise rotation to form the middle limb of a Z-shaped oroclinal fold of ~400km amplitude, arriving against the eastern margin of the Selwyn Block in the Early Devonian. There was concomitant clockwise rotation of the Hay-Booligal Zone and northern portion of the Stawell Zone as they were peeled out from their former position along the Delamerian craton margin. The Hay-Booligal Zone may restore as part of the Macquarie Arc. The western limb of the Z-fold includes the Bendigo Zone. The eastern limb includes the Mallacoota Zone. Hinge regions are the east–west trending portions of the northern and southeastern Tabberabbera Zone, and southwest Kuark Zone.

This is a powerful new model. It does not require multiple subduction zones to explain reversals in vergence and observed complex distribution of sedimentary packages, explaining them by subsequent oroclinal folding developed ahead of strike-slip faults. It also fits new aeromagnetic data, and explains the palaeogeographic relationships without need of the Baragwanath Transform concept.

STUDENT FUNDING OPPORTUNITIES

Geological Society of Australia (Victoria Division) Student Research Scholarships

The GSAV are pleased to offer up to \$10,000 per year in scholarships available to honours and postgraduate students for assistance with travel costs associated with conferences and field work. The number and value of the scholarships awarded each year is made at the discretion of the GSA(Vic) committee.



Funding for travel within Australia is capped at \$500 and funding for international travel is capped at \$700.

Students that receive this scholarship are required to submit a report for publication in the newsletter, "The Victorian Geologist", following their trip. A presentation may also be requested by the committee, which will consist of a short, 10-15 minute presentation prior to the monthly seminar.

Completed application forms can be scanned and emailed to: secretary@vic.gsa.org.au or mailed to:

Geology Research Scholarships Victoria
Geological Society of Australia (Victoria Division)
GPO Box 2355
Melbourne VIC 3001

Applications forms will be available on the website soon or can be requested from Barbara Wagstaff (wagstaff@unimelb.edu.au). More information including eligibility criteria can be found on the form and by contacting Barbara.

The Future of Cities in the Low Carbon Economy - FREE PUBLIC SEMINAR

What will cities look like in a low carbon economy? Should we expect a radically different way of life? What role will information technology play in the future city and the process of transformation; will there be enough power to run the internet? In light of these, and other important questions regarding the future of cities, experts will discuss challenges and innovation in areas such as building design, heating and cooling, lighting, transport, and information/communication technologies.



When: Wednesday 18th August, 6.15pm – 8.15pm

Where: Carrillo Gantner Theatre, Sidney Myer Asia Centre, University of Melbourne

Chaired by: Mr Peter Mares (ABC Radio National, Swinburne University of Technology)

Speakers: Professor Rob Adams AM (Director, City Design, City of Melbourne), Professor Chris Ryan (Director, Victorian Eco-Innovation Lab, University of Melbourne), Mr Michael Ambrose (Group Leader, Urban Dynamics and Transition group, CSIRO), Professor Rod Tucker (Director, Institute for a Broadband-Enabled Society, University of Melbourne)

BICENTENNIAL GOLD 88 ENDOWMENT

The Trustees of The Australasian Institute of Mining and Metallurgy Education Endowment Fund are pleased to announce that the twenty-second round of financial awards from The Bicentennial Gold 88 Endowment will be made in the year 2011 for the advancement of education and research in Earth Sciences for the benefit of Economic Geology in Australia.

In the year 2011, a total of \$10,000 will be available for distribution through (and with the approval of) a university, in one or several of the following:

- Scholarships to senior university students and researchers for study and / or research in Australia in:
 - Economic Geology
 - Mineral Economics
- Technical visits
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- Environmental Geoscience as applied to the Exploration / Mining Industry.

Those wishing to apply for an award under this Endowment should submit in writing a detailed proposal and justification for the financial support to:

The Director
Bicentennial Gold 88 Endowment
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PO Box 660, Carlton South,
Victoria, Australia 3053

Some conditions may apply.

The decision of the Trustees regarding these awards is final and no further communication will be entered into.

**Applications close on
Wednesday, 29 September 2010**



AusIMM
THE MINERALS INSTITUTE
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An Ancient Earth Like Ours: Geologists Reconstruct Earth's Climate Belts Between 460 and 445 Million Years Ago

Science Daily

An international team of scientists has reconstructed the Earth's climate belts of the late Ordovician Period, between 460 and 445 million years ago. The findings have been published online in the Proceedings of the National Academy of Sciences -- and show that these ancient climate belts were surprisingly like those of the present.

The team of scientists looked at the global distribution of common, but mysterious fossils called chitinozoans -- probably the egg-cases of extinct planktonic animals -- before and during this Ordovician glaciation. They found a pattern that revealed the position of ancient climate belts, including such features as the polar front, which separates cold polar waters from more temperate ones at lower latitudes. The position of these climate belts changed as the Earth entered the Ordovician glaciation -- but in a pattern very similar to that which happened in oceans much more recently, as they adjusted to the glacial and interglacial phases of our current (and ongoing) Ice Age.

See full text for more information:

Vandenbroucke, T.R.A., Armstrong, H.A., Williams, M., Paris, F., Zalasiewicz, J.A., Sabbe, K., Nolvak, J., Challands, T.J., Verniers, J. & Servais, T. Polar front shift and atmospheric CO₂ during the glacial maximum of the Early Paleozoic Icehouse. Proceedings of the National Academy of Sciences, 2010; DOI: 10.1073/pnas.1003220107

FORTHCOMING SEMINARS AND EVENTS

to be presented at
GSA (Victoria Division) meetings

Note: unless otherwise indicated, all 2010 talks will be held in the Fritz Loewe Theatre, Earth Sciences Building, University of Melbourne.

August 26 **Ross Cayley**, Geoscience Victoria: South-directed oroclinal folding in the Lachlan Fold Belt: unravelling Mid-Late Silurian fold belt assembly to solve apparent Ordovician–Early Silurian complexity

September 30 6:15pm **SELWYN LECTURE** and presentation of Selwyn Medal
see website for further details in the coming weeks

October 28 **Robyn Pickering**, The University of Melbourne: South African early hominin evolution

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