

PROJECTS OF THE TECTONICS SRC FOR 2000–2002

The Centre runs projects to achieve its defined goals. Five broad areas of research were identified in the original proposal, viz:

- Palaeomagnetism
- Regional geology and geochronology
- Analogue and numerical modelling
- Regional geophysics
- Synthesis and continental reconstruction.

Owing to the shortfall between the ARC CPI supplementation and salary and project costs, the Tectonics Centre gave higher priority to Palaeomagnetism, Regional Geology and Geochronology and Continental Reconstruction projects in the 2000–2002 triennium. Analogue Modelling and Regional Geophysics were retained in the desired program, but could not be funded significantly from the SRC grant.

CORE BUSINESS

The core business of the Tectonics Centre is to produce reconstructions of the distribution of continents and oceans through the last three billion years, and the projects that address this are accorded highest funding priority. The distinctive aspect

of the Tectonics SRC is its aim to synthesise existing information and produce global reconstructions for a large interval of Earth history, which has not been attempted systematically before anywhere in the world. Our prime focus is on Precambrian reconstructions between 2,800 Ma and ca 530 Ma. To make robust reconstructions that can be tested and falsified scientifically, we have to be familiar with the availability and quality of a great range of geological and palaeomagnetic information. We must collect primary information in selected areas, not only to fill crucial gaps in existing knowledge, but also to inform ourselves about the reliability and accuracy of the information that is gathered by others. We have thus selected a few key areas where we concentrate our field projects.

CORE PROJECTS

The core projects for 2000–2002 were determined by the Research Management Committee in December 1999 by ranking possible projects against the stated aims of the Centre. Several of these projects have external collaboration and support grants. Project numbers relate to the projects described in the 1997 (p. 19–30) and listed in the 1998 (p. 25) and 1999 (p. 41) Tectonics SRC Annual Reports.

Project 1.1: Rodinia Assembly and Dispersal Maps (incorporating IGCP 440: Rodinia Assembly and Breakup)

Aims:

This project aims to produce a series of GIS-based global palaeogeographic maps illustrating the formation and breakup of the supercontinent Rodinia. This is being achieved through the support and active involvement of the International Geological Correlation Program project, IGCP 440, which was initiated by the late Professors Chris Powell and Raphael Unrug (Wright, USA) for the duration of 1999–2003. IGCP 440 continued to enjoy strong support in 2002 of both its >300 strong members from 40 countries, and the IGCP Scientific Board. Current project co-leaders are Professors S. Bogdanova (Sweden) and H. Kampunzu (Botswana). Dr Z.X. Li of TSRC joined them as co-leader in late 2002, and Dr Sergei Pisarevsky, also of the TSRC, became the new project secretary.

The progress of IGCP 440 in 2002 was again rated as “Excellent” by the IGCP Scientific Board, and a high level of funding was recommended.

Progress:

With the TSRC continuing to be the administrative centre of IGCP 440, and host to its digital maps, significant progress was made during 2002 in the making of the Rodinia maps. In addition, IGCP 440 sponsored a number of successful international events, and its members (including most of the TSRC researchers) are producing an increasing number of scientific publications. Following are just a few of the scientific achievements and progress made by members:

- The generation of a set of preliminary rotational parameters for global palaeogeography of the 1100–740 Ma interval, as well as a corresponding computer animation;
- Legend for the 1:10 million Rodinia maps finalised (can be viewed under IGCP 440 at <http://www.tsrc.uwa.edu.au>), and the first draft of map sheets for Baltica, northern Laurentia, Siberia, and South China compiled. Compilations of other continents are also in progress (see

report on the Rodinia Map Compilers Workshop). Current map compilers for each continent/craton are (in alphabetical order): **Africa**—A.B. Kampunzu, J.P. Milesi and co-workers; **Antarctica**—J. Dalziel, I. Fitzsimons and J. Jacobs; **Australia**—J. Myers; **Baltica**—S. Bogdanova and V. Pease; **Greenland**—E. Kalsbeek and K. Thrane; **India**—M. Pandit and others; **Laurentia**—A. Davidson, K. Karlström and G. Ross; **Siberia**—D. Gladkochub, S. Pisarevsky and V. Vernikovskiy; **South America**—B.B. de Brito Neves and R. A. Fuck; **South China**—Z.X. Li; **Tarim and North China**—S. Lu and co-workers. There are also members who are responsible for compiling specific databases, such as mafic dyke swarms (R. Ernst), glacial deposits (D. Evans) and mineral deposits (C. Finn and others);

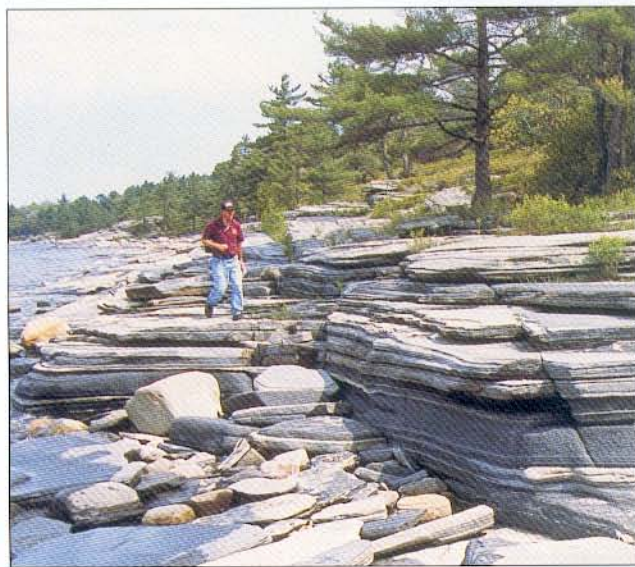
New palaeomagnetic data by TSRC researchers from the Maud Province of East Antarctica support it being part of the Kalahari craton at ca. 1100 Ma (TSRC Publ #208). New, precise U-Th-Pb SHRIMP zircon data from the Grenville-aged Maud Belt revealed metamorphic zircon overgrowth, Pb loss in zircon cores and syn-tectonic granite intrusions between c. 1090 and 1060 Ma. This age range is seen as representing high-grade metamorphism and continent collision;

Neoproterozoic mafic dyke swarms and sedimentary rocks indicate a rift event leading to a passive margin along the western part of the southern Siberian margin (TSRC Publ #192). Other work also suggests that the southern margin of Siberia might be the only margin connected to another continental block during Rodinia time, but this connection was broken up during the breakup of Rodinia; East Asia in Rodinia: tighter constraints on the timing of collision and breakup. Members of the IGCP 440 East Asia Working Party, including members of the TSRC, made breakthroughs in 2002 in providing tighter age constraints on events that are related to Rodinia assembly and breakup in the region. New studies revealed that convergent tectonic regimes along both the southern and northern margins of the Yangtze craton persisted until ca. 900 Ma. With 1000–900 Ma metamorphic events widely reported in other Grenvillian orogenic belts around the world, it is possible that the assembly of Rodinia did not finish until ca. 900 Ma. It has also been revealed that an extensional tectonic regime started from at least ca. 830

Ma in the region, and lasted until ca. 750–700 Ma (TSRC Publs #192, 193, 194, 195, 200, 201). The wide spread of similar events in other parts of Rodinia, and evidence for mantle plumes, led to the proposition of a Rodinia superplume (see report in Research Highlights).

IGCP 440-sponsored international events included:

1. A session at the GAC-MAC Saskatoon conference (27 to 29 May 2002) on “Aspects of Rodinia assembly exemplified in the Grenville province”, and the post-conference field workshop to the southwestern Grenville Province (30 May to 7 June 2002). The special session was convened by Dr A. Davidson (Geological Survey of Canada), who also led the spectacular field excursion along with Dr R.M. Easton (Ontario Geological Survey), Dr L. Corriveau (Geological Survey of Canada), and Professor J. Martignole (Université de Montréal). Two days were set aside during the field trip for an indoor workshop on Grenvillian belts around the world and relevance to the assembly of Rodinia, as well as for an IGCP 440 business meeting. The field workshop was attended by sixteen scientists from Australia, Canada, China, USA, Sweden, and a number of local geologists and students. Dr Z.X. Li from the TSRC attended the event.



“Straight gneiss” in the Parry Sound shear zone, Central Gneiss Belt of the southwestern Grenville Province, Canada

Photo: Z.X. Li

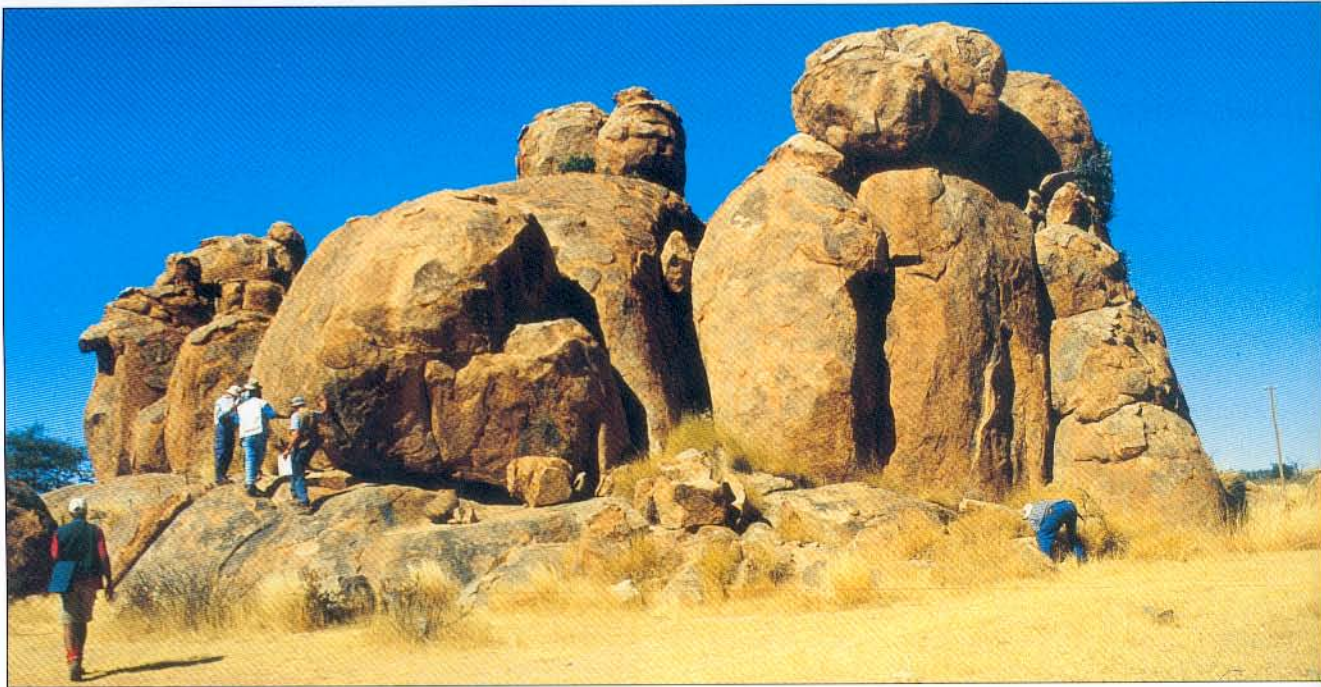
- IGCP 440 Sessions at the IAGOD Symposium (22 to 26 July 2002) and the post-symposium field trip to the Sinclair-Namaqua Mesoproterozoic province (27 July to 4 August 2002). IGCP 440/418 joint sessions were organised as part of the 11th Quadrennial IAGOD Symposium in Windhoek, Namibia with 40 papers presented on various aspects of Mesoproterozoic and Neoproterozoic geology, geochronology and ore geology. A field workshop to the Mesoproterozoic of Namibia was led by Drs Hoffmann, Thomas and Schreiber of the Geological Survey of Namibia. A major outcome of the field workshop was the recognition that the characteristics of the Mesoproterozoic terranes in Namibia do not match those of the Grenvillian belt to which they have been correlated by some workers. Mr B. De Waele of the TSRC (Curtin node) attended this event.
- The Rodinia map compilers workshop, Perth, 11 to 15 November 2002 (see report under Workshops and Symposia). The major outcomes of the project in 2002

where TSRC researchers were heavily involved are (1) the finalisation of the Rodinia map legend, and the preliminary drafting of a number of map sheets, with TSRC members playing major roles in a number of map sheets and special databases, and (2) the increasing number of scientific contributions by members, including many important discoveries by TSRC researchers (see full IGCP 440 contribution list on the TSRC web site: <http://www.tsrc.uwa.edu.au/>).

Aims and events for 2003:

Apart from continuing internationally collaborative research on the assembly and breakup of Rodinia, a major aim of the project in 2003 is to finish all of the regional map sheets for the Rodinia map, and to use these map sheets to test various Rodinia reconstructions. Two IGCP 440-sponsored field symposia have been planned for 2003:

- International workshop and field excursions in Sri Lanka



Gamsberg granite, Namibia

l-r: Helmut Garoëb (Geological Survey of Namibia), Charles F Gower (Geological Survey of Newfoundland and Labrador), K.H. Hoffmann (Geological Survey of Namibia), Henri A.B. Kampunzu (University of Botswana), Toby Rivers (University of Newfoundland), unidentified person on far right

[Photo: B De Waele]

on "The role of Sri Lanka in Rodinia and Gondwana assembly and breakup", 30 March to 4 April 2003: A one-day workshop was planned at the Institute of Fundamental Studies (IFS), Kandy, which will be followed by a five-day field excursion. Both the Grenvillian and Pan-African basement geology of Sri Lanka will be examined, and proposed correlations with southern India, East Antarctica and East Africa will be discussed. For more information, please contact Wilbert Kehelpannala (kvwilbert@hotmail.com), Alfred Kröner (kroener@mail.uni-mainz.de), or look at the web site <http://www.tsrc.uwa.edu.au>, under the IGCP 440 upcoming events.

2. South China field symposium on assembly and breakup of Rodinia, 9 to 18 October, 2003: An 11-day event is being organised in eastern South China, with a two-day indoor symposium in the coastal ancient capital of Hanzhou, followed by a seven-day field trip through central Zhejiang Province, northeastern Jiangxi Province, finishing at the scenic Huangshan mountain in southern Anhui Province. Geological outcrops examined will include the late Mesoproterozoic to earliest Neoproterozoic eastern Sibao orogen, and 820–750 Ma bimodal magmatic complexes

Project 1.2.2a: Palaeomagnetism of East Asia

This project will be relevant to Research Programs 2.1, 3, 4 and 5 from 2003 onwards.

Aims:

This project, which focuses primarily on palaeomagnetic analysis, is part of an ongoing collaborative research program with Chinese scientists on the Precambrian tectonic history of eastern China and its significance in the evolution of Rodinia. The prime aim of this project is to obtain high-quality palaeomagnetic poles from both the South China and the North China Blocks for the examination of various Rodinia reconstructions. Whereas the TSRC project funds cover some travel and analytical costs, fieldwork and costs related to the broader tectonic analysis are largely covered by Chinese sources (the National Natural Science Foundation of China-NSFC,

and coeval continental rift successions possibly related to the breakup of Rodinia. More details can be found at the web site <http://www.tsrc.uwa.edu.au>, under the IGCP 440 upcoming events, or contact Professor Shihong Zhang at shzhang@cugb.edu.cn.

In addition, the following project activities were planned at major international conferences in relation to the making of the Rodinia map:

3. EGS-AGU-EUG Joint Assembly, Nice, France, 6–11 April 2003: Regional map compilers of the Rodinia map will hold an informal workshop to comment on and exchange the map sheets.
4. A special session on Rodinia maps and reconstructions at the GSA meeting at Seattle, 2 to 5 November 2003: This will be the first time that all map sheets compiled for the 1:10 million Rodinia map will be presented and displayed, and various Rodinia reconstructions will be debated.

Participants: Almost all TSRC researchers and all members of IGCP 440.

and three major collaborating organisations), matched by a UWA Small Grant.

Progress:

2002 was mostly a production year, with numerous papers on the results of tectonic research over a number of years being published in a Precambrian Research special issue co-edited by Z.X. Li and others.

Whereas new palaeomagnetic and geochronological results from the Neoproterozoic Xiaofeng dyke swarm of the South China Block are still being written up for publication, a paper on new results from Meso- to Neoproterozoic successions in North China (in collaboration with Professor S. Zhang of China University of Geosciences) is close to being submitted.