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Middle Proterozoic to Cambrian Rifting, Central North America

G. M. Ross

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proximal (Hart *et al.*) and distal to the arc (Blakey and Parnell) is well demonstrated. The importance of precise, mainly U-Pb, geochronology in dating and correlating events is emphasized in publication of new U-Pb and K-Ar dates in 11 of the 19 contributions: the large compendium of new ages for the southern Coast Mountains by Friedman and Armstrong is a landmark contribution. New geochemical data are found in six papers; radiogenic isotopic tracer data in three papers, of which the Ghosh and St. J. Lambert paper is outstanding. Gerber *et al.* provide the best example of the integration of comprehensive and diverse geochronological, geochemical and isotopic data sets. Inclusion of some discussion of mineral deposit formation (papers by Ward, and Presnall and Parry), is welcome, because metallogeny is rarely considered by tectonicists yet is an undeniable and economically important crustal process in the Jurassic. Discipline-oriented lists summarize the wide-ranging content of the volume, but are somewhat misleading here because most papers integrate several types of data to arrive at their conclusions (papers by Wolf and Saleeby, Elison, and Miller and Hoisch are exemplary in this regard).

The volume opens with a lengthy, provocative view of Mesozoic and Cenozoic subduction cycles involving the western North American margin by Ward. Following Ward's "tour-de-tectonics," the volume's more topical contents are organized in three groups, from north to south, and approximately oldest to youngest: Canadian Cordillera (Yukon and British Columbia: six papers); Klamath Mountains, Sierra Nevada and Great Basin (eight papers); and southwestern United States desert regions and Colorado Plateau (four papers). Within each group, papers are organized in sequence from magmatic arc eastward.

The consistent layout and format of the papers in the volume are up to the GSA's usual high standard of excellence. Authors might have more carefully considered or have been coached by the editors on the final layout specifications when choosing line widths and patterning for their maps and sections: some figures are reduced to near illegibility.

As is the case with most proceedings-style volumes, this compendium of generally excellent papers would benefit from a final synthesis paper — a kind of "epilogue" to update Ward's process-focused introduction — which would tie together the disparate contributions into a Cordillera-wide whole. At the least, such a summary would alert the Jurassic newcomer to the areal significance of an individual paper's contribution. The editors' rebuttal might be that the only contributor capable of such a broad understanding of the entire Cordilleran Jurassic tectono-magmatic event is, sadly, the person to whom the Special Paper is a memorial. For the non-aficionado, a generalized distribution map of Jurassic rocks annotated with the study area locations would have been a valuable addition to the preface and/or the table of contents. Similarly, an author index, to accommodate collaborative papers containing as many as nine authors, would have been a worthwhile companion to the detailed subject index included at the back of the volume.

This volume provides an important three-dimensional look into the components of a now-eroded, subduction-driven Cordilleran orogeny. GSA Special Paper 299 provides a handy repository of new data, ideas and critical literature references for this geologically interesting and diverse period, and is a monument to the efficacy of a multidisciplinary approach in deriving new first-order syntheses and models. Only the somewhat steep price tag for the volume will impede its appearance on the bookshelves of researchers interested in either the wide variations in tectonic and magmatic regimes evident in a well-studied tectono-magmatic belt, or in the overall evolution of Jurassic rocks along the North American continental margin. Merchandizing niggles aside, the special paper succeeds in bringing together the former twin solitudes of Jurassic tectonics research north and south of the 49th parallel, to their mutual benefit.

Middle Proterozoic to Cambrian Rifting, Central North America

Edited by Richard W. Ojakangas, Albert B. Dickas and John C. Green
Geological Society of America
Special Paper 312
1997, 328 p., US$100.00, paperback

Reviewed by G.M. Ross
Geological Survey of Canada
3303 33 Street NW
Calgary, Alberta T2L 2A7

This special paper is a collection of 18 papers that describes various elements of the Midcontinent Rift System (MRS) and also examines postulated extensional basins of Eocambrian age within the midcontinent of North America, the United States in particular. The MRS is one of the world's most spectacular and well-studied ancient rift basins, even though it is buried throughout much of its length and generally not well exposed. It is characterized by distinctive potential field signatures that allow it to be traced for a strike length of nearly 2000 km, comparable in length to the modern East African Rift system. Recent high-precision U-Pb geochronology indicates a short duration for the formation of the remarkable magmatic products that fill this structure (*ca.* 20 m.y.), and recent crustal seismic reflection data (the GLIMPCE survey) illuminate the geometry and dramatic consequences of crustal rifting that for some reason did not proceed to open ocean.

The compendium of papers begins with an integrated overview of the MRS by W.J. Hinze and others, which is an excellent regional framework paper and includes a comparison with the East African Rift system. Importantly, these authors offer unanswered questions and outstanding remaining problems for future research. This paper sets the stage for the subsequent paper by A.B. Dickas that amplifies the comparison with African rift systems and describes the segmented nature of the MRS. The subsequent paper by D.J. Allen and others uses a grid of seismic reflection lines and potential field modeling to offer details of the geometry of fill within the MRS in the western Lake Superior re-

gion. J.D. Miller and V.W. Chandler present new results from mapping and geochemical study of the Beaver Bay Complex, an igneous complex adjacent to the Duluth Complex, which will appeal to igneous petrologists. Two papers on structural geology, the first by K.M. Witthuhn-Rolf and the second by J.P. Craddock and others, examine strain associated with development and inversion of the MRS. The first paper examines kinematics of more than 600 minor faults, and the second paper examines strain preserved in twinned calcite. Both show an interesting history of deformation likely related to inversion of the MRS as well as younger Paleozoic strains. Several papers provide an economic flavor and examine the geology of the MRS from the perspective of the genesis of the famous native copper deposits of the MRS (T.J. Bornhorst), the types of oxide and sulfide mineralization associated with the Duluth Complex (S.A. Hauck and others) and Pb-Zn-Ag veins in the Port Coldwell area of Ontario (T.C. McCuaig and S.A. Kissin). The latter are interpreted as distal effects of the late hydrothermal activity associated with the MRS. The petrography and sedimentology of the Nonesuch Formation, famous for preservation of Precambrian organic material, is addressed in a paper by T. Suszek, who opts for a lacustrine *versus* marine setting for the Nonesuch Formation. Several papers discuss the extension of the MRS southwards into Iowa (R.R. Anderson), Nebraska (M.P. Carlson) and Kansas (P. Berendsen). The final five papers deal with post-MRS extensional basins and structures of the midcontinent. B.H. Richard and others discuss evidence for pre-Middle Cambrian basins in western Ohio, and T.J. Stark discusses structures of the East Continent Rift Complex, an amalgam of structural elements that lies within the midcontinent. An additional, more detailed paper on the Reelfoot Rift and related Rough Creek graben by D.R. Kolata and W.J. Nelson offers insight into the evolution of a sedimentary succession that forms the base of the Illinois Basin. The final paper, by V.P. Hogan and M.C. Gilbert, has a different flavor altogether, and examines the shape and chemistry of felsic intrusions emplaced into the Southern Oklahoma Aulacogen during earliest Cambrian time.

In general, this is a good publication that contributes to growing datasets and studies of Proterozoic extensional basins in the midcontinent of North America. Most of the papers are reviews and overviews with a few new data papers. I was not particularly impressed with the quality of many of the figures, which were poorly reproduced. In addition, with the abundance of potential field data in the papers, I was surprised that not a single one was published in color, especially given the US$100 price tag! These shortcomings aside, this publication offers a nice overview of the geology and geophysics of the MRS and a good starting place for the interested reader to get into the literature.

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Dr. H. Helmstaedt
Department of Geological Sciences
Queen's University
Kingston, Ontario K7L 3N6

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