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# Book review

High-strain Zones: Structure and Physical Properties. In: Bruhn, D., Burlini, L. (Eds.), 2005. Geological Society, London, Special Publications, vol. 245, 452 pp., hardback, £95, ISBN: 1-86239-178-5.

High-strain zones excite structural geologists. After all, strain is what we study. We love to follow outcrops of undeformed rocks into folded areas and ever increasing fabric intensity until everything gets stretched to smithereens. High-strain zones deserve a book devoted to them. They deserve this book.

This compilation of 22 papers represents a balanced selection of traditional structural studies, such as regional field studies, case studies, and rock mechanics with some interesting geophysical, GIS, thermochronology, and microanalytical additions. There is a slight lean towards laboratory studies, which reflects the editors' expertise, and their discussion of recent developments in this field and summary of the various causes of strain localization serves as an appropriate introduction.

The introduction is followed by four well-documented field studies of strain localization in the middle crust to upper mantle. Their focus ranges from AMS and thermochronology (Teyssier et al.) to the insightful geometric ponderings of Passchier et al. Interestingly, all four studies involve a melt component. It would have been nice to see a few more examples of less ductile high-strain zones like Edwards and Ratschbacher's interesting presentation of the Damxung-Jiali Shear Zone.

The next 10 contributions focus on the rheology of high-strain zones. This topic is also addressed via a number of approaches, the main still being laboratory experiments. The papers progress from the characterisation of high-strain zones with geophysical techniques such as AMS (Sidman et al.) and magnetotellurics (Ritter et al.) into the crossover between geophysics and rock mechanics with Burlini et al.'s cleverly modified Paterson rig used to record the seismic properties of rocks at temperatures up to 600 °C and 0.5 GPa. A series of comprehensive lower temperature deformation experiments on limestone, flint, and gypsum by Schubnel et al., Mainprice and Paterson, and Barberini et al. respectively, employ modern imaging and analysis methods such as high-resolution TEM, X-ray computed tomography, and IR spectroscopy. Bruhn et al. investigate the effect of grain size on melt distribution and ultimately strain localization in dunites with implications for mantle rheology. This section ends with a thoughtful treatise by Evans. He plants the seeds of a framework of constitutive laws for progressive deformation that will be beneficial for both laboratory experimentalists and numerical modellers.

The next three papers explore specific relationships between fluids and faults. Wibberley blames meteoric waters for phyllosilicate formation allowing decollement generation and continuation. He terms the process "reaction weakening". Curiously, there is no cross-referencing with Neimeijer and Spiers' laboratory study on the influence of phyllosilicates on fault strength in this book. Rossi documents geochemical changes in various vein sets associated with a greenschist facies Alpine fault. Muto et al. exhibit some new tools for imaging the microscale distribution of water in high strain zones with vague, but promising results.

The last few papers (including Muto et al. above) represent a mix of modern techniques applied to the study of high strain zones. Fernández et al.'s novel use of GIS functions is a long awaited update for fabric analysis. Schmid's numerical models of rigid objects other than the typical circle or ellipse in shear produce surprising results. For example, despite their corners, triangles and squares do not rotate in pure shear.

The illustrations are superb; the maps are easy to read and the figures are informative. Many are bound to show up in future structural geology textbooks. Most impressive is the 6-page fold out cross section (Burg et al.) of an island arc from its upper mantle to its middle crust that obviously synthesizes a huge amount of field work. The colour photographs in Edwards and Ratschbacher's article highlight what is lacking from some of the otherwise useful outcrop and microscopic scale textural photos that copiously fill the book. However, the use of colour look up tables for contoured data is unnecessary in several of the articles.

The only flaw in the book is perhaps the overrepresentation of geologists from west-central European institutes. Over half of the contributors are from Germany, Switzerland and France. The US is also strongly represented, but more than half of these contributors are from Minnesota universities. Contributions from some of the other structural groups in the UK, Australia, Canada, and elsewhere in the US may have improved the book. This is perhaps a reflection of the conference location, where the idea for this publication originated, and the editor's institutes: two European strongholds of geology.

There are alternative ways the book may have been set out (e.g., from high to low grade studies), but the end result would not be much better. Baud et al., Niemeijer and Spiers, and Wibberley would perhaps have been better presented

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successively as they progress from bedding/foliation anisotropy to phyllosilicate growth to decollement formation.

This refreshing focus on actual rocks at all scales leaves only two contributions on numerical modelling. Nothing is included from the analogue modellers leaving a noticeable gap in the book's coverage. There are also only three articles dealing with the relationships between high-strain zones and hydrothermal fluids or ore deposition. However, fluids are often addressed in individual articles.

All of the articles that comprise this book share a few common features: the science is tight, the presentation is complete and exact, and the work presented is important. The editors are applauded for ensuring that almost every paper was reviewed completely externally (i.e., not by authors within the same book). Given its subject matter and high quality of science and presentation, this book belongs in the library of all structural geologists.

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