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EDITED BY

D. GAPAIS, J. P. BRUN and P. R. COBBOLD

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This volume is derived from the 13th meeting on Deformation Mechanisms, Rheology and Tectonics (DRT2003). The meeting was held in St Malo (Brittany, France) in April 2003, and organized by an informal group from Géosciences Rennes (UMR 6118 CNRS, Rennes University), including Michel Ballèvre, Stéphane Bonnet, Arlette Falaise, Olivier Galland, Frédéric Gueydan, Charles Gumiaux, Benjamin Le Bayon, Alain-Hervé Le Gall, Monique Le Moigne, Sylvie Schueller, and Céline Tirel. It was sponsored by the Centre National de la Recherche Scientifique, Rennes University, the city of Rennes, the Conseil Général d’Ille et Vilaine, and the Région Bretagne. Forty-eight reviewers have worked hard to improve the papers. We thank these persons and institutions for their contributions.

The volume contains 18 papers that cover most of the topics and ideas presented and discussed during the meeting. The main approaches are experimental rock deformation, microstructural analysis, field studies, and analogue and numerical modelling.

Several papers provide new insights on grain-scale and aggregate-scale mechanisms, with new methodological implications (Gueydan et al., Reddy & Buchan, Zubstov et al.) and new advances on the knowledge of deformation processes and rock rheology (Austin & Kennedy, Austin et al., Baratoux et al., Drury, Gueydan et al., Köhn et al., Mirabella et al., Renard et al., Zubstov et al.). About half of the contributions provide new information or models for processes at crustal or lithospheric scales (Blenkinsop & Kisters, Brown, Delacou et al., Drury, Handy et al., Raimbourg et al., Ranalli et al., Spalla et al., Willingshofer et al.), with particular emphasis on mantle rheology (Drury), thickening tectonics (Willingshofer et al., Handy et al.) and various aspects of exhumation processes (Blenkinsop & Kisters, Delacou et al., Raimbourg et al., Ranalli et al.).

The first meeting that led to the DRT series was in Leiden in 1976. Henk Zwart, Richard Lisle, Gordon Lister and Paul Williams were the organizers. The meeting was basically dedicated to Fabrics, Microtextures and Microtectonics. Since then, DRT meetings have accompanied international advances in the understanding of kinematics, mechanics and large-scale tectonic processes, which largely derived from important progress in the knowledge of rock rheology via experimental deformation, and in physical and numerical modelling. We hope that the present volume will further contribute to strengthening the links between studies of geological deformation processes at microscopic to lithospheric scales.

Denis Gapais, Jean-Pierre Brun and Peter Cobbold
Rennes, October 2004
Dedication to Pierre Choukroune

Pierre Choukroune was born in Casablanca on 28 March 1943. He celebrated his 60th birthday a few weeks before the DRT2003 meeting in St Malo. Pierre received a PhD from Paris University in 1967 and a "Doctorat d'Etat" from Montpellier University in 1974. The subject of both theses was the structural geology of the Pyrenees. The second thesis was published as Mémoire 127 of the Société Géologique de France. Pierre started his professional career in 1967 as "Assistant" (Assistant Lecturer) at Montpellier University. In 1975, he moved to Rennes as Professor. He stayed at Rennes until 1995, when he moved to the University of Aix-Marseille.

Building on his early fieldwork in the Pyrenees, Pierre rapidly acquired a prominent and highly personal scientific profile. His interests have always spanned various scales, from detailed analysis of microstructures, through regional patterns of strain and displacement (e.g. Choukroune 1976) to plate tectonics (Choukroune 1992). Of the more than 100 papers that he has published in international journals over the last three decades, many have had major impacts on structural geology and tectonics.

One of his first papers (Choukroune 1971) was on the analysis of pressure shadows around pyrite crystals, as a tool to understand the development of slaty cleavage. As pointed out by Ramsay and Hubert (1983) in their textbook, "This is an outstanding paper from the viewpoint of descriptive excellence, the quality of the diagrams and photographs and the theoretical analysis of data". This paper contains many of the ideas that Pierre further put forward, in particular the search for criteria of shear senses in deformed rocks.

Soon after his arrival in Rennes, Pierre was taken to see the granite mylonites of the South Armorican Shear Zone. He immediately realized the significance of the typical fabric of the rock that results from the coeval development of a schistosity and of shear bands parallel to the bulk shearing plane, and consequently introduced the now famous concept of C/S fabrics. Pierre put every effort into bringing them to international attention (Berthé et al. 1979a, b). The discovery was to open more than a decade of research on shear criteria.

Because of his wish to find a strong link between plate tectonics and structural geology, Pierre has been in close contact with a number of geophysicists. In 1974, Xavier Le Pichon asked him to join FAMOUS, the French-American project that studied fault patterns on the Mid Atlantic Ridge (Choukroune et al. 1978). He later took his expertise to the East Pacific Rise (Hekinian et al. 1983; Choukroune et al. 1985) and the Gulf of Aden, where he acted as Chief Scientist for the CYADEN cruise (Choukroune et al. 1988). When the French deep seismic program ECORS was launched in the early 1980s, Pierre acted as Chief Scientist for the first French-Spanish profile across the eastern Pyrenees. The result was a major contribution of deep seismic data to the understanding of a mountain belt (Choukroune et al. 1989).

As a team leader, Pierre had a profound influence on the development of structural geology and tectonics at Géosciences Rennes. His initiatives in the Hercynides, the Alps (Choukroune et al. 1986), and several Archaean cratons (Choukroune et al. 1995; Choukroune & Ludden 1997) provided training grounds for a number of young structural geologists from Rennes and elsewhere. None of his PhD students and colleagues at Rennes escaped his thoughtful suggestions and his unusual scientific lucidity and inspiration. Even though he liked to say, 'we
are a team’, what some researchers call the ‘Rennes school’ bears his signature.

As a professor, Pierre’s teaching style – elegant and to the point – has inspired many careers in Earth Sciences. His book, ‘Déformations et déplacements dans la croûte terrestre’ (1995), summarizes much of his scientific philosophy. As well as an outstanding scientist and teacher, Pierre has been an efficient and distinguished academic administrator, for the University, the CNRS, and the Ministry of Education, where he has held a number of important positions.

The DRT meeting in St Malo was shortly after his 60th birthday. We therefore take the greatest pleasure in dedicating the proceedings to Pierre Choukroune, a talented, innovative and inspiring Earth scientist.

Jean-Pierre Brun, Peter Cobbold and Denis Gapais

References


