

## PREFACE

IN RECENT years there has been a growing interest in shear zones, especially ductile shear zones. This is in part due to their uniqueness in that they commonly preserve all the stages in a geological process; in this case the deformation of rocks and associated foliation development. They are also of interest because they are zones of preferential deformation, often over long periods of geological time, and may influence other processes. Therefore it is not surprising to find that new ideas about natural deformation processes are generally first applied to shear zones.

Because of this interest in shear zones, it appeared that it was an opportune time to bring together earth scientists interested in different aspects and scales of ductile deformation in rocks by dominant simple shear. Consequently, an international conference on Shear Zones in Rocks was held in Barcelona (Spain) from 15 to 17 May 1979. Most of the papers presented at the meeting are contained in this volume.

The conference was divided into four main sessions, each looking at shear zones on successively smaller scales. The arrangement of the papers in this volume follows the same four-fold sub-division used at the conference.

The first session dealt with the tectonic setting of shear zones and covered aspects of simple shearing on the regional scale. Contributions dealt with the spatial distribution of shear zones, shear zone geometry in different tectonic regimes and at different tectonic levels, and with associated structures such as folds and faults. The conference then went on to consider the kinematics and mechanics of shear zones. This section was concerned with stresses, displacements, strains, strain rates and heating associated with the initiation and development of shear zones. Deformation mechanisms together with microstructural and microfabric development in shear zones were discussed in the third session. The conference concluded with a consideration of the petrology, mineralogy and geochemistry of shear zones and included a discussion of metamorphic and chemical changes induced in rocks by shearing.

The second and third sessions were the best subscribed, reflecting present research activity in the fields covered. Both of those sessions were highlighted by animated discussion. The relatively few papers delivered in the final session probably reflected the lack of completed research in this general area. The prolonged

discussions following the papers in the last session suggested a keen interest in the topic amongst the conference participants, and that much research was in progress but was at a preliminary or intermediate stage at the time of the conference.

The following main points emerged from the meeting: (1) shear zones on all scales are zones of weakness and represent localized strain softening although this may not be pronounced in granulite facies environments; (2) in ductile shear zones the softening is associated with mylonite development and may result from several processes; (3) transient brittle behaviour can occur in ductile shear zones; (4) sheath folds are common in mylonite zones and experiments suggest that they can form in both steady state and non steady state flow regimes; (5) there is little evidence to indicate that shear heating is common in ductile shear zones; (6) shear zones may act as both closed and open geochemical systems irrespective of their size; and (7) analogue materials do appear to produce microstructures and fabrics similar to those seen in the natural situation.

The conference was followed by two field excursions. The first was for one day and looked at the late Hercynian shear zones at Cap de Creus. The second was of four days' duration and covered the geology of the eastern Pyrenees. It was jointly arranged by the Universities of Barcelona and Toulouse.

The conference was organised by J. Carreras, P. R. Cobbold, J. G. Ramsay and S. White with help from a local co-ordination committee consisting of M. Julivert, A. San Miguel and P. Santanach. P. Debat, J. Deramond and C. Lamouroux co-organised the Pyrenees excursion. The conference was sponsored by the Department of Petrology and Faculty of Geology of the University of Barcelona, and the Instituto de Investigaciones Geológicas. The Caixa d'Estalvis de Barcelona kindly made available their lecture theatre and associated facilities.

The organisers wish to thank the above organisations, the speakers, chairmen and participants who made the conference a memorable success. We also wish to thank all of the people, especially the geology students at Barcelona, who contributed to the day-to-day preparation for the conference and field trips.

*J. Carreras and S. White* (on behalf of the organising committees)