Journal of Structural Geology, Vol. 8, Nos 3/4, pp. v to vi, 1986
Pergamon Press Ltd. Printed in Great Britain

Preface

1984 MARKED 100 years of thrust-tectonics. It was in 1884 that Geikie first defined thrusts, using the initial findings of the Geological Survey team sent to map the structure of NW Scotland. The area had raised considerable controversy and heated debate during the previous 50 years; many people could not understand why metamorphic rocks should lie above non-metamorphosed Cambrian sediments. It was Callaway (1883) and Lapworth (1883) who recognized that these metamorphic rocks were basement which had been subjected to large horizontal translations. During the next ten years or so, Peach *et al.* (1888, 1907) described the thrust structures in detail, estimating displacements, demonstrating thrust sequences in basement and cover rocks and producing analogue models of the structures (Cadell 1888). During that same period, from 1884 to the turn of the century, similar exciting discoveries were being made in continental Europe. Bertrand (1887) described thrusts and their relationship to overturned folds in the Provençal Alps, and he used his experience there to reinterpret the Glaris structure as a single major recumbent fold that had been thrust at least 35 km northwards (Bertrand 1884). By 1888 Törnebohm was proposing 100 km of thrusting in Scandinavia, and in 1893 Schardt interpreted the Pre-Alps as huge thrust outliers or klippen derived from the internal zones of the Alps. Many of the 'rules' of thrust tectonics, which are still used at the present day and which were developed to a great extent by workers on the oil geology of the Canadian Rockies (Douglas 1950, Bally *et al.* 1966, Dahlstrom 1969, 1970), have their roots in these developments at the end of the last century.

During the period 1975 to 1984, there was a resurgence of interest in thrust tectonics in Europe, fuelled by the enthusiasm of Dave Elliott. He realized that the advances in thrust interpretation made by hydrocarbon geologists in North America could be applied to the areas where thrusts had long been discovered—in Scotland and the Alps (Elliott & Johnson 1980, Boyer & Elliott 1982). In 1970 there was a meeting on thrust and nappe tectonics in London (McClay & Price 1981) but by 1984 there was an obvious need for another conference to follow the rapid change of ideas. It aimed to review the state of the art in thrust tectonics, and the value of the new concepts for interpreting both the smaller-scale deformation associated with thrusting and the large-scale tectonics of mountain belts.

The meeting was organized for the Spring of 1984, the centenary of the first major works on thrust tectonics. Toulouse was chosen as the venue partly because of its proximity to the Pyrenees, and partly because of the enthusiasm of the Toulouse structural group. The meeting was organized by the Université de Paul Sabatier with a local committee led by Joe Deramond, Pierre Debat and Jean-Claude Soula. The conference occupied three crowded days from 15 to 17 May, with geological excursions to the north and south sides of the Pyrenees on the 13–14 and 18–19 May. The field trip and guide were organized by an international group including Joe Deramond, Pierre Viallard, Jean-Claude Soula, Pierre Labaume, Michel Seguret, Mick Fischer, Graham Williams and Jake Hossack. Blizzard conditions affected the Pyrenees during excursions!

Well over 300 people attended the conference, 95 papers were given as lectures and there were 46 poster presentations. The meeting showed that there was certainly no present day consensus on the application of empirical thrust rules, and there were again heated debates on thrust tectonics, particularly on assumptions of simple layer-cake stratigraphy, plane strain and the problems of ductile deformation.

This volume includes 22 of the papers read at the meeting. Some modify the thrust 'rules' or take them further, discussing the roles of folds, cleavage and secondary faulting to thrust tectonics. Others discuss the effect of ductile strain or folding on section balancing and fault restoration. Several papers apply thrust tectonics to a wide range of orogenic belts; two deal with the Canadian Rocky Mountains; others with Switzerland, Scandinavia, the various Spanish orogenic belts, Morocco and the South Orkney islands. The structural geologists from BP develop models from the frontal tips to thrust belts, to show how displacements die out, with examples from France, Pakistan and Alaska.

Many of the papers given at the meeting and published here, deal with fault geometry, as that is where the main advances have taken place in recent years. There were less papers dealing with deformation mechanisms and the mechanisms of thrusting. It is obviously important that this theme be developed in future if only to help constrain the possible interpretations of fault structure. As many thrust belts are exposed at the surface, and not buried or beneath sea level as are their extensional counterparts, we have the opportunity to examine fault-rock and wall-rock structures and deformation mechanisms. This will help us interpret the fault history and structure at depth.

The meeting's theme was originally suggested by Dave Elliott in 1982. Sadly he died later that year. The organizers wish to dedicate the conference and publications to him as a tribute to his considerable influence on the subject. Five of his research students gave talks at the meeting and present papers here. Most of the other contributors, and certainly the editors, have been very much influenced by his work and inspired by his contagious enthusiasm for the subject.

The conference organizers would like to thank the staff and students of the Laboratoire de Géologie/Pétrologie, Toulouse, for their help during the meeting. They also wish to acknowledge with gratitude the financial help provided by the following organizations:

Centre National de la Recherche Scientifique;
La Ministère de l'Industrie et de la Recherche;
Le Counseil Régional Midi-Pyrénées;
La Ministère de l'Éducation Nationale;
La Société Elf-Aquitaine;
L'Université Paul Sabatier.

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