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## FOREWORD

This study was commenced in 1961 during the tenure of a post-graduate exchange scholarship between the Imperial College of Science and Technology, London, and the E.T.H., Zürich. The primary aim was a study of the Upper Carboniferous sediments of the Biferten inlier, under the guidance of Professor Dr. R. Trümpy, Zürich. In 1962 the topic was accepted as a thesis study at the E.T.H., and further work during the summers of 1962–65 under the supervision of Professors Dr. R. Trümpy and Dr. A. Gansser extended the field work to the Maderanertal and Val Gliems areas.

The results were prepared in the Geological Institute of the E.T.H. and University, Zürich, where the detailed field maps and specimens are deposited.

My deepest thanks are due to Professors R. Trümpy and A. Gansser for the supervision of this work, their advice in the field and laboratory and their valuable criticism of the manuscript. The continued interest and encouragement of Professors J. Sutton and J. G. Ramsay of Imperial College are warmly appreciated.

During the preparation of the study much kindly assistance with various problems was given by Professors C. Burri and E. Dal Vesco and P.D. Dr. R. Hantke of Zürich. Profitable discussions and a field trip in the Biferten area in 1965 with Professor Th. Hügi of Bern are remembered for their cordiality. To all I wish to express my most sincere thanks.

Messrs. M. Zuber and E. Schärli are thanked for their help with the preparation of thin-sections and photographs.

The financial support of the exchange scholarship of the E.T.H. which made the greater part of this study possible is thankfully acknowledged.

Above all I wish to thank my wife, Sibylle Franks-Dollfus, for her help and understanding.

## INTRODUCTION

Although pre-Triassic rocks cover an area roughly equal to that of the Mesozoic and Tertiary rocks in the Alps, their history is much less well known. They form relics of older orogenic belts which have been overwhelmed by the Upper Cretaceous-Miocene orogeny and involved with the later sediments in the complex Alpine deformation, partly overthrust, as in the Eastern Alps, the Pennine nappes and the Briançonnais Zone, locally remetamorphosed and intruded by younger igneous rocks. In the external massifs, from Argentera in the south-west to the Aar Massif in the north-east, the pre-Triassic rocks preserve their earlier structures and expose a fragmentary picture of the Hercynian and older basement complex and the small basins of Upper Palaeozoic sediments.

At the eastern extremity of the external massifs (Zentralmassive of most German-speaking authors), in the eastern Aar Massif, three small areas of pre-Triassic sediments are exposed within the crystalline rocks. These areas have in the past been studied separately by several geologists, and have given rise to a number of conflicting opinions on the origin and age relationship of the sediments. The present study has been undertaken to resolve some of the problems by detailed stratigraphical and structural investigations of these three isolated areas, and attempt to lay down some general correlations with the late Palaeozoic rocks of neighbouring areas. The results of previous geologists have been summarized for each area in order to illustrate the conflicting views and the evidence on which they are based. The regional significance of the results of the present study is discussed in the final chapter.

### *The Main Problems*

One of the greatest controversies in the eastern Aar Massif concerns the age of the Tödi granite and its associated contact metamorphism, and the question of whether or not it is related to the Central Aar granites. FAUL (1962) stated: '... the Tödi granite ... is thought to be stratigraphically younger than Westphalian D and probably older than Permian (WIDMER 1949). It is the only stratigraphically recognized Hercynian rock in the central Alps, but it is badly altered and a measured age is not available.

The study of contacts between crystalline rocks and stratigraphically dated sediments is extremely difficult in areas as severely smashed as the Alps. It is not surprising that a contact may appear to be much more "eindeutig" in the literature than it actually is in the field. The question whether the Tödi granite really does intrude the Westphalian D would be answered quite differently by different field geologists who have studied the area.'

The two possibilities are that the Tödi granite and its related pegmatites do intrude the dated Upper Carboniferous sediments (ESCHER 1911, who considered that only