

R T Russell, Honours thesis 1957

**The structure and petrology  
of rocks close to the Broken  
Hill Lode.**

Supervisors: B R Lewis, E A Rudd

# C O N T E N T S

## SUMMARY

## INTRODUCTION

## ACKNOWLEDGEMENTS

### PART I

#### THE STRUCTURE OF THE BROKEN HILL MINING AREA

1. FARLY OPINIONS ON BROKEN HILL STRUCTURES.  
C. W. Marsh  
E. C. Andrews  
Sir Douglas Mawson  
E. S. Moore
2. THE WORK OF E.C. ANDREWS, 1922
3. THE CENTRAL GEOLOGICAL SURVEY  
General Rock Succession and Stratigraphy  
The C.G.S. Structures
  - a. Folding
  - b. Faulting
4. DEVELOPMENT OF STRUCTURAL IDEAS SINCE C.G.S.
5. RECENT WORK AT BROKEN HILL SOUTH LTD.  
The Rock Succession  
Explanation of Cross-sections  
The Structure of the Area  
In Conclusion

### PART II

#### PETROLOGICAL ASSISTANCE IN SOLVING BROKEN HILL STRUCTURES

1. THE PROBLEM OF THE POTOSI GNEISSES
2. THE HANGING WALL GNEISSES
3. A STUDY OF BROKEN HILL APLITES

### PART III

#### A DISCUSSION OF THE ORIGINS OF ROCKS CLOSE TO THE MAIN LODGE

1. BANDED IRON FORMATION
  2. AMPHIBOLITES CLOSE TO THE MAIN LODGE
  3. THE SILLIMANITE GNEISSES
  4. SERICITE SCHISTS
  5. THE PLAGIOCLASE "QUARTZITES"
  6. THE ORIGIN OF THE POTOSI GNEISSES
  7. THE ORIGIN OF THE HANGING WALL GNEISSES
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## SUMMARY

The thesis consists of a review of Broken Hill "mine area" structure and the Archean stratigraphy on which it is based. A fourfold division was made.

### Part I

This contains a review and discussion of the structural geology close to the main lode. The concept of "en echelon" folding as opposed to "parallel" folding (advocated by past geologists) was introduced in the latest structural interpretation.

### Part II

The second section is a comparative petrographic study of several local "marker horizons" at Broken Hill.

viz.,

Potosi Gneiss  
Hanging Wall Gneiss  
Aplite

The recognition of several distinct horizons of each of these rock types was stressed in Part I. Potosi-like gneisses occur at three separate stratigraphic levels, and the Hanging wall gneisses at two. A microscopic examination led to the conclusion that these rock types are petrologically different. The aplites and "quartzites" collected from widely separated sources were studied with a view towards a possible petrological correlation. Such was not possible.

### Part III

The petrogenesis of several structurally important rock types was reviewed. Namely,

Banded Iron Formation  
Amphibolite  
Sillimanite Gneiss  
Sericite schist  
Plagioclase "quartzite"  
Potosi Gneiss  
Hanging wall Gneiss

A microscopic study provided information for a reappraisal of petrogenetic ideas. The role of metasomatism in the genesis of sericite schist, Potosi Gneiss, "quartzite" and Hanging Wall Gneiss was stressed, as opposed to a "dry transformist" approach. On the other hand, the amphibolites were regarded as originally igneous bodies that has suffered intense metamorphism with a lesser degree of metasomatism.

Banded Iron Formation and sillimanite gneiss were undoubtedly sedimentary rocks prior to metamorphism.

Part IV

Part IV consists of thin section descriptions which provided data applied in Parts II and III. A division was made into Part II thin section descriptions and, secondly, those specimens and rock suites used in the study of rock origins.

The correlation of the granitic-type gneisses (Part II) was satisfying enough, but conflicting evidence as to their origins still leaves room for much speculation. The answer must lie in shrewd observation of field relationships that may be exposed by future exploration and development. The application of sounder chemical principles to such processes as metasomatism and granitisation is also desired. Controversy concerning the origin of these rocks will not cease until theories of "wet" and "dry" diffusion and suchlike have been clarified by indisputable experimental evidence.