

## I. INTRODUCTION AND ACKNOWLEDGEMENTS

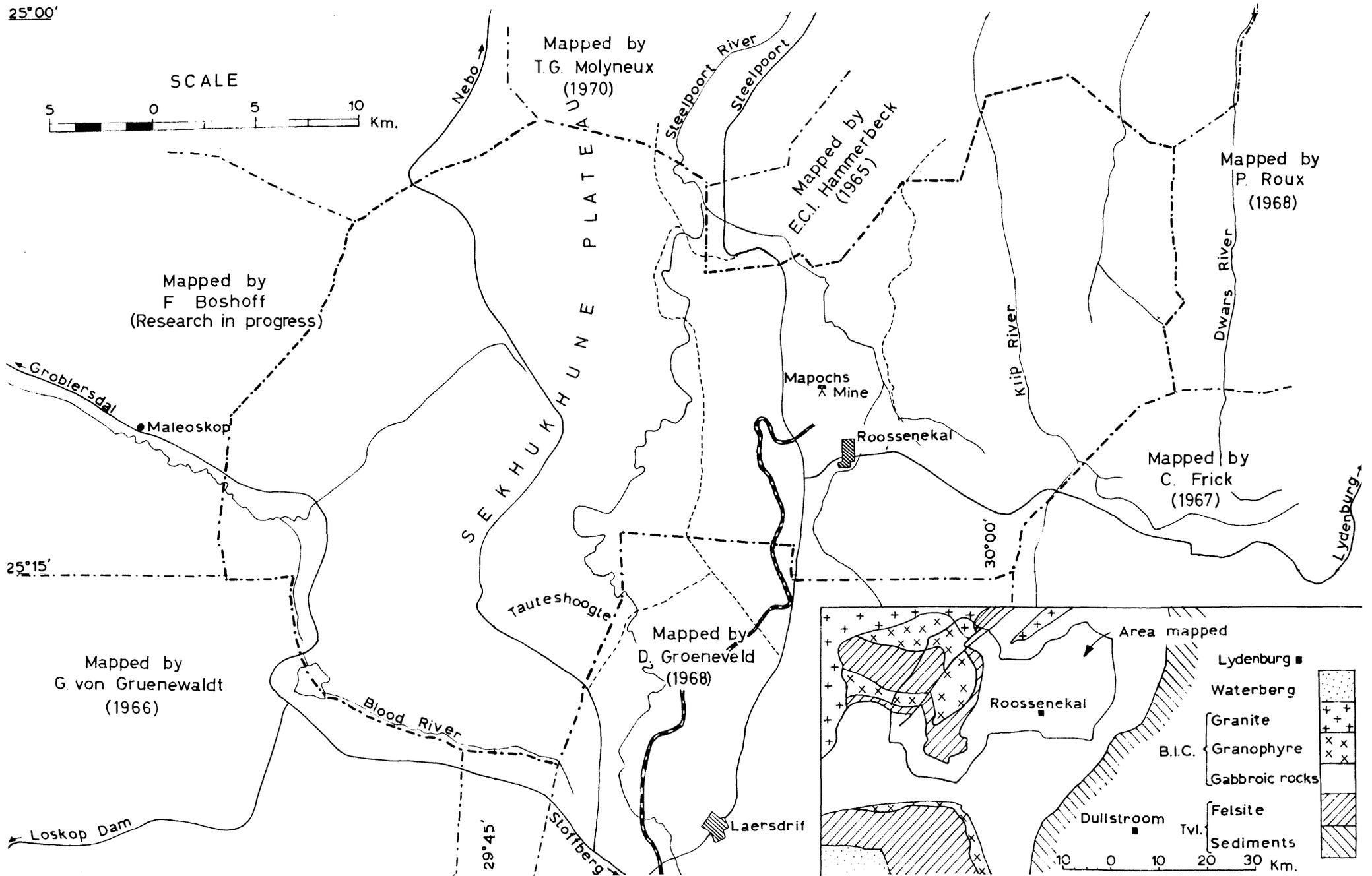
Over the past few decades, post-graduate students and staff of the Department of Geology of the University of Pretoria have been actively engaged in the study of rocks of the Bushveld Complex. In the course of these investigations practically all the aspects of this complex have been covered, such as structure, metamorphism, the Layered Sequence, acid rocks, and minerals of economic importance. These investigations left an area of approximately 850 sq. km in the vicinity of Tauteshoogte and Roossenekal (Fig. 1) where little or no work has been done during the past 20 to 30 years. It was consequently decided to investigate this area as part of a scheme of the Geological Survey whereby Geology Departments at Universities are invited to participate in its mapping programme with the aim of expediting publication of geological sheet maps of the Republic on a scale of 1:125 000.

Mapping of the area was done on aerial photographs (scale 1:36 000) during the winter months of 1968 and the information obtained was transferred on to 1:50 000 topocadastral maps from which the final geological map was compiled (Folder I).

Petrographical and mineralogical investigations of the collected specimens were undertaken at the Geology Department of the University of Pretoria from 1968 to 1971. The laboratory studies were mostly confined to rocks of the Layered Sequence and special attention was given to orthopyroxene, plagioclase, apatite and the sulphides in the Upper Zone. Detailed accounts of the mineralogy of the magnetite are given by Molyneux (1964, p. 41-56; 1970a, p. 51-114; 1970b, p. 231-240), Groeneveld (1968, p. 125-154) and Willemsse (1969b) which obviated the necessity of an investigation of this mineral. Some attention was given to the textures of the rocks of the Layered Sequence which yielded interesting information on the postcumulus changes. In addition, two parameters, plotted against height in the intrusion, are proposed by which the trend of differentiation in layered intrusions can be illustrated graphically.

The terminology to describe magmatic sediments has evolved from the work of Wager and Deer (1939, p. 271) on the Skaergaard Intrusion and Hess's (1960) as well as Jackson's (1961) work on the Stillwater Complex. Reviews and definitions of terms are given by Wager *et al.* (1960) and modified by Jackson (1967, p. 22). In the present study it was deemed advisable to retain the term

FIG.1: PLAN SHOWING ADJACENT AREAS MAPPED BY VARIOUS AUTHORS, AND LOCALITY MAP (INSET)



"adcumulus growth" because it was originally coined by Wager et al. (1960, p. 77) for the extension of the cumulus crystals by material of the same composition. Jackson's term "postcumulus growth" (Jackson, 1967, p. 23) is not restricted to material of the same composition and zoned crystals may be the result. As most of the plagioclase of the Layered Sequence shows only slight zoning, and where present, only at the outermost rims of the crystals, the term "adcumulus growth" is considered to be more appropriate. Other terms used in this treatise are "intercumulus material" which are the minerals formed by the filling of the spaces after adcumulus enlargement, and "intercumulus liquid", i. e. the liquid that occupied the interstices between the cumulus crystals before and after adcumulus enlargement.

Previous work in this area was done by Boshoff (1942) who investigated the relationships between the various rocks east and north of Tauteshoogte and by A. F. Lombaard (1949) who undertook a similar study of a large area west of Tauteshoogte. The purpose in remapping these areas was largely to determine whether the relationships between the various rock types conform to the latest conceptions regarding the origin of these rocks. B. V. Lombaard (1934) analysed various specimens collected by him along a traverse east and west of Roosenekal, with the purpose of determining the trend of differentiation of the Layered Sequence.

During the course of the investigation, numerous persons and organisations rendered valuable assistance, without which this study would not have been possible.

Financial assistance in the form of honoraria to cover expenses of mapping was rendered by the Geological Survey of the Department of Mines and by the Anglo American Corporation of South Africa Limited. A large number of the laboratory investigations were done during 1970 while the author was the recipient of a bursary from the National Institute for Metallurgy.

Rand Mines Limited made available the core of a 1340m deep bore-hole of the lower part of the Main Zone and Anglo American Corporation of South Africa Limited gave access to the core of two shallow bore-holes on the farm Doornpoort 171 JS.

The Director of the Geological Survey accepted samples of rocks and minerals for chemical analyses by the National Institute for Metallurgy.

Drs D. R. Bowes and T. G. Molyneux made available chemical analyses

and CIPW norms of rocks from the Main and Upper Zones prior to publication.

Accommodation while field work was being undertaken was provided by Messrs. J. G. van den Heever and J. J. du Toit, as well as by the Management of the Mapochs Mine of Highveld Steel and Vanadium Corporation Limited.

Miss P. S. Martin did the final draughts for most of the diagrams in the text.

The Transvaal Board for the Development of Peri-Urban Areas granted permission to use information contained in a report on the mineral potential of the Roossenekal townlands, which was compiled for the board by the late Prof. J. Willemse.

Last, but by no means least, thanks are due to my promoters, Dr C. P. Snyman and Dr E. B. Förtsch for their many helpful suggestions and discussions and to my wife for her patience and encouragement as well as for the typing of the manuscript.