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Section I-Introduction

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SECTION I—INTRODUCTION

A. REASONS FOR REVISION

Revising the work of early scientific pioneers is an unenviable task but one which becomes a necessity when erroneous identifications outweigh the constructive value of the older work, often leading inevitably to wrong conclusions about age and relationships.

The necessity for a complete revision of the fossil plants occurring in the predominantly Devonian formation known as the Cape System has long been apparent. The more important reasons for undertaking this task at this time are summarised below:

1. The Inadequacy of Previous Records

The earliest records were not only very meagre but often inaccurate and since they have never been refuted they are still quoted. For example, as far back as 1870 specimens were sent from Grahamstown to the British Geological Survey for identification since the possibility of exploitable coal measures in the Bathurst area had been envisaged. The identifications were made by Bristow and included the following: *Sigillaria*, *Stigmaria*, *Lepidodendron*, *Lepidostrobus*, *Halonia* and *Selaginites*. *Not one of these genera is now known to occur in the Cape System*. The reasons for the wrong determinations are not now known. Specimens from another country may have been mixed up but the list was quoted by Feistmantel (1889, p. 26,) by du Toit (1926, p. 198) in his first edition of the "Geology of South Africa" and quoted by Mountain (1962) in the most recent description of the Port Alfred stratigraphy. In this way the error has been perpetuated.

No attempt at a general summary of early plant fossils has been made since the publication of papers by Seward (1903) and Schwarz (1906). A few of the plants were discussed further by Seward (1909 and 1932) but even the genera named by these authors have been subdivided and often renamed. Reliable references are rare and illustrations even more so, with the result that modern field geologists usually resort to calling any plant fossil in the Cape System "an unidentifiable stem".

2. The availability of new material

In the course of remapping portions of the Cape Province a number of new specimens have been found which the Geological Survey has kindly placed at my disposal. These added to the old museum and survey collections have made it possible to envisage a whole flora.

3. The importance of South African fossil floras in World Stratigraphy

Of growing importance in world stratigraphy is the comparison of every aspect, and at every stage of the geology, of various southern continents. In this, plant fossils must play a major role in formations which lack the usually more numerous and easily comparable marine invertebrate remains. The plant records of the upper part of the Cape System provide valuable evidence of the age of the formation and in addition furnish evidence of former land areas for palaeogeographical reconstructions.

Caster (1952) in discussing South American and South African relationships wrote "It is critical to such a correlation that the little known terrestrial flora of the Dwyka and Witteberg should be restudied". Similar views are shared by many.

4. Evolutionary Significance

From an evolutionary point of view the Devonian was a critical period for, in the course of it, the greatest experiment in the history of plant life occurred. Plants which had previously lived almost exclusively in an aquatic environment appeared in considerable numbers on land.

Plant life at this transition period had many features in common so that a closer relationship is apparent between Devonian plants throughout the world than between those of any subsequent period. In recent years interest in early land plants has increased enormously and much detailed investigation has been undertaken. A wealth and variety of Devonian plants is now known, sometimes in considerable anatomical detail, from parts of North America and of Europe and, because of the general similarity, comparisons with the Cape fossils are possible at the generic level. Nevertheless it must have been at this time that the foundations were laid for the separate development which later characterised the plant life of the northern and southern groups of land. A study of the Cape fossil plants could determine whether the subsequent changes were due to differing environmental factors acting on a common stock or to some inherent differences in the early floras themselves. This aspect will be considered further in the Summary.

5. The importance of palaeontological records in the current search for oil in South Africa

Finally the importance of all palaeontological records in the very accurate stratigraphical correlations attendant on oil investigations is obvious. The deep drilling programme currently being undertaken in the Cape Province and elsewhere in the Republic gives the present investigation an economic interest which could not have been claimed previously.

B. THE MATERIAL STUDIED

1. Difficulties of classification

Despite the great desirability of compiling an up-to-date record of the early plant life of Africa the task is a difficult one for in the predominantly arenaceous rocks of the Cape System the degree of preservation of plant matter tended to be limited in the first instance to the more resistant portions, and was further masked by the intensity of pressures during the subsequent orogenic folding of the mountain belt. The area is extensively mountainous and often extremely rough—the magnificence of the scenery being a measure of the difficulties of traversing it and I have been unable to undertake extensive field collecting.

2. Source of the fossils described and acknowledgements

The study is based on fossil plant collections at the Albany Museum in Grahamstown and at the South African Museum in Cape Town. In the latter museum are housed most of the plant fossils collected by geologists of the Geological Commission of the Cape of Good Hope before 1910, and, after Union, by members of the Geological Survey of South Africa. I am greatly indebted to the Directors of these museums for the opportunities provided to examine their collections and especially for the loan of a number of specimens for more detailed study and photography.

Unfortunately the exact source locality of some of these early specimens is unknown.

For later specimens I am indebted to Messrs. J. N. Theron and J. Loock who sent me the fossils they had collected in the course of studying portions of the Cape System for M.Sc. degrees at the University of Stellenbosch where the best of these specimens are now displayed in the museum of the Geology Department. J. N. Theron subsequently joined the Geological Survey and is engaged on mapping in the Cape Fold area. I am grateful to Dr. O. R. van Eeden, Director of the Geological Survey, and the Assistant Director Mr. P. J. Rossouw for sending me all the plant fossils collected recently from Cape System rocks for inclusion in this report. They will in future be housed in the Geological Survey Museum in Pretoria and some at the Bernard Price Institute for Palaeontological Research—Johannesburg, as part of the Palaeobotanical Collection of the University of the Witwatersrand.

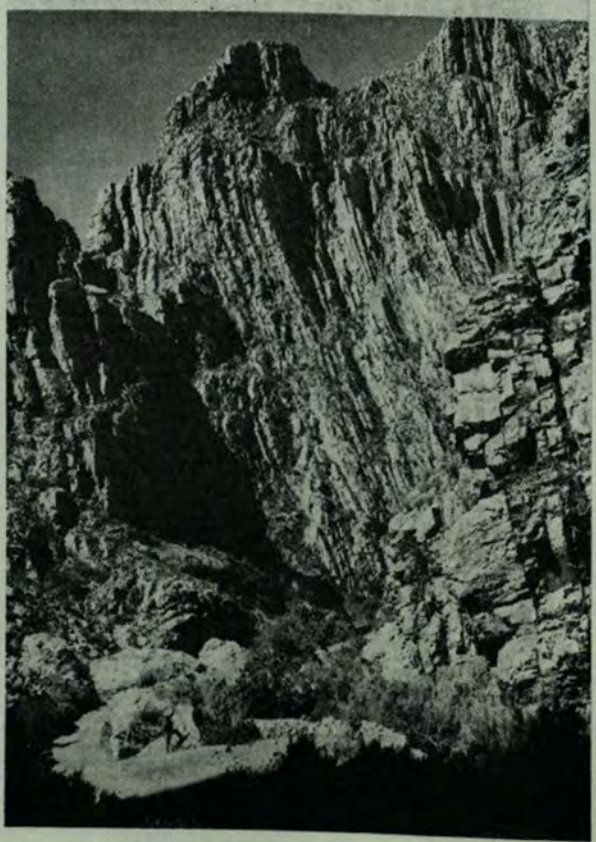
In addition to those mentioned above who provided material for study I should like to thank the following who in various ways have contributed to the preparation of the report. I have corresponded with Devonian authorities in other parts of the world where great advances have recently been made in this field of study and in particular I am indebted to Professor Harlan Banks, of Cornell University and Dr. F Hueber of the Smithsonian Institute, Washington,

U.S.A., Professor Susanne le Clercq of Liège, Dr. Chaloner of Imperial College, London, and Professor R. Kräusel of Senckenbergische Institute, Frankfurt, for valuable discussions.

To those Palaeobotanists who have sent me their papers on Devonian fossils from many parts of the world I am grateful. I wish to thank also Dr. Orlando of Argentine who procured for me some of the late Professor Frenguelli's papers which were otherwise unobtainable, and the Director of the C.S.I.R.O., Australia who kindly sent me unpublished palaeobotanical reports of areas currently being studied in that continent. I would like to thank Mr. Mark Hudson of the Geology Department, Witwatersrand University, for assisting me with the photography.

Finally I am indebted to the University of the Witwatersrand where the work has been carried out and to the C.S.I.R. of South Africa for research grants and for publication grants in which the Geological Survey has assisted also.





These photographs illustrate the intensity of the pressures to which the Cape System was subjected and the resultant topography of the Cape Fold Belt. The upper picture is of overturned folds in the T.M.S. near Montague S. W. Cape and the lower one of the Swartberg Pass between Prince Albert and Oudtshoorn farther to the east.

Fig I S. A. Railways