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INTRODUCTION

It is almost 50 years since T.W. Gevers delivered the first du Toit Memorial Lecture in which he documented his previous colleague's career. However, the revolution in the earth sciences which has occurred during those 50 years has presented us with new perspectives with which to view du Toit's contributions.

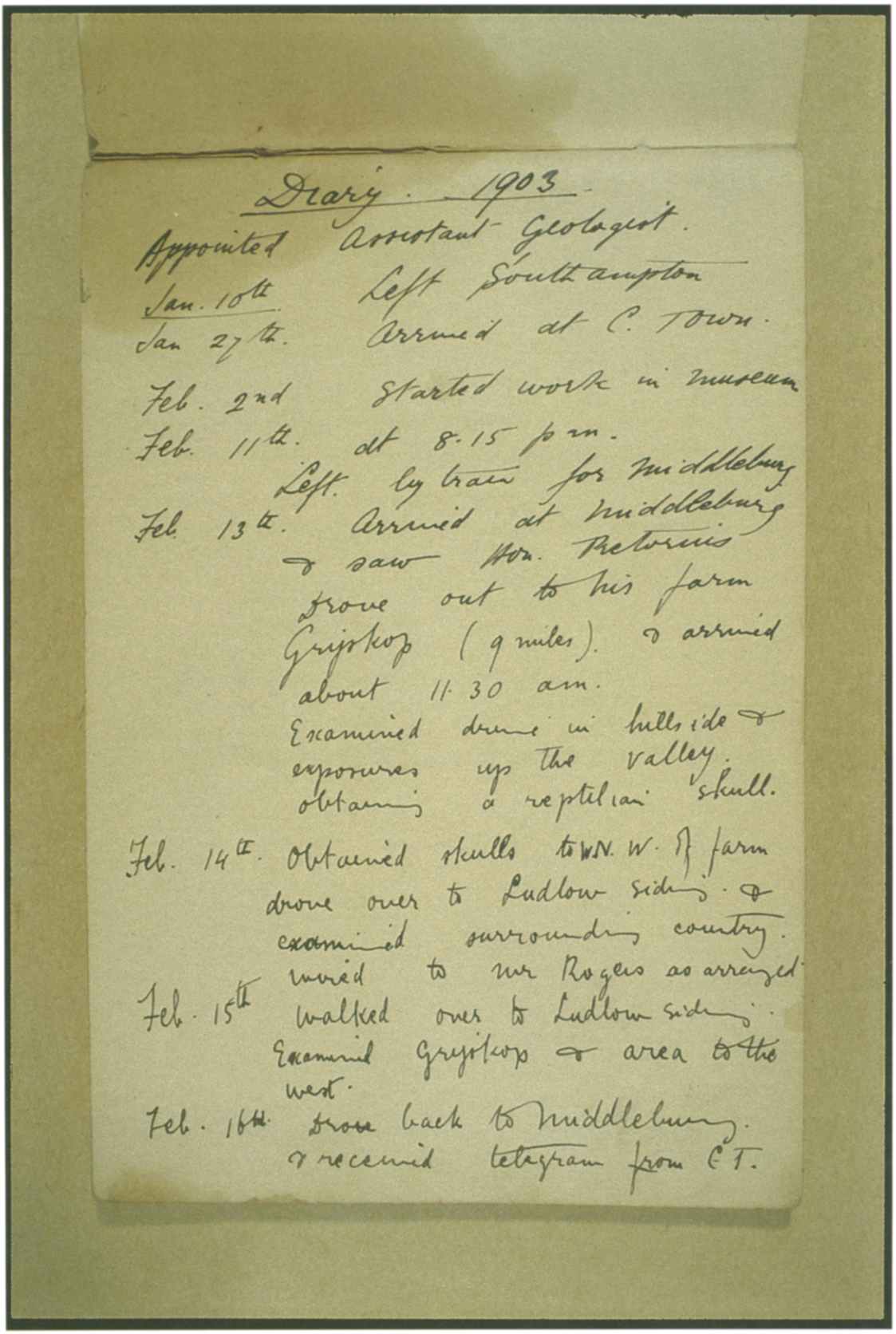
When du Toit joined the scientific staff of the old Cape Commission in 1903 he was in his twenty-fifth year (see Fig. 2, p.4). After schooling in Cape Town he had obtained degrees in mining engineering from the Glasgow Technical College and geology from the Royal College of Science, London. He had returned to his place of birth from a Lectureship at the University of Glasgow, who were to award him their D.Sc. degree seven years later.

It is doubtful that du Toit entertained any thoughts of 'drift' at this stage in his career. But perhaps he had been intrigued by von Humboldt's theory that the lands bordering the Atlantic Ocean had once been joined. Certainly his textbooks would have included Lyell's classic 'Students Elements of Geology' and he may have pondered that respected authority's comment that: "We need not be surprised, therefore, if we learn from geology that the continents and oceans were not always placed where they are now."

TOWARDS CONTINENTAL DRIFT

By 1903 only the bold outlines of South African geology had been recorded on maps associated with the pioneer Edward Dunn. This comparatively rudimentary status was to be completely transformed by du Toit and his colleagues during the next 20 years by virtue of their detailed mapping of vast tracts of the country, du Toit himself covering a staggering 50,000 square miles. Transport was primitive - he mostly walked or rode a bicycle or motorbike and sometimes camped for months with his family using a horse-drawn wagon (Fig. 1). Of course aerial photographs were not yet available; he used a small plane-table and produced maps of incredible accuracy. Although his fieldwork brought him into contact with the full spectrum of lithologies, it was his mastery of Karoo stratigraphy and palæontology (du Toit, 1926) which was to kindle his life long interest in Wegener's postulates. He familiarised himself with the geology of India and the southern hemisphere continents. He was able to visit Australia and South America, the latter in 1923, as a Carnegie Grant holder, resulting in the benchmark paper (du Toit, 1928) on the comparisons of the geology of South America and South Africa (Fig. 3). There is no doubt that du Toit was strongly inclined towards drift before his South American visit having, in 1921, expounded his views at a Natal meeting concerned with the origins of coastlines. At that meeting we can sense his trepidation in promoting drift before a hostile audience in his

Figure 1. *Reproduced from 'The life and work of Dr Alex L du Toit', by Gevers (1949). With du Toit in the photograph are his first wife, Adelaide Walker (†1923) and their only son.*



Diary. 1903.

Appointed Assistant Geologist.

Jan. 10th. Left Southampton

Jan 27th. Arrived at C. Town.

Feb. 2nd Started work in museum

Feb. 11th. at 8.15 p.m.
Left by train for Middleburg

Feb. 13th. Arrived at Middleburg & saw Hon. Pretorius drove out to his farm Grijskop (9 miles). & arrived about 11.30 am.
Examined donga in hillside & exposures up the valley.
obtaining a reptilian skull.

Feb. 14th. Obtained skulls to W.N.W. of farm drove over to Ludlow siding. & examined surrounding country.
moved to mr Rogers as arranged

Feb. 15th walked over to Ludlow siding.
Examined Grijskop & area to the west.

Feb. 16th. drove back to Middleburg.
& received telegram from C.T.

Figure 2. *Opening page of Alex du Toit's first field notebook after his return from England (reproduced with permission from the University of Cape Town Archives). This page announces his departure from Southampton back to South Africa to take up his post with the Cape Commission in 1903. Clearly he wasted no time to get into the field.*

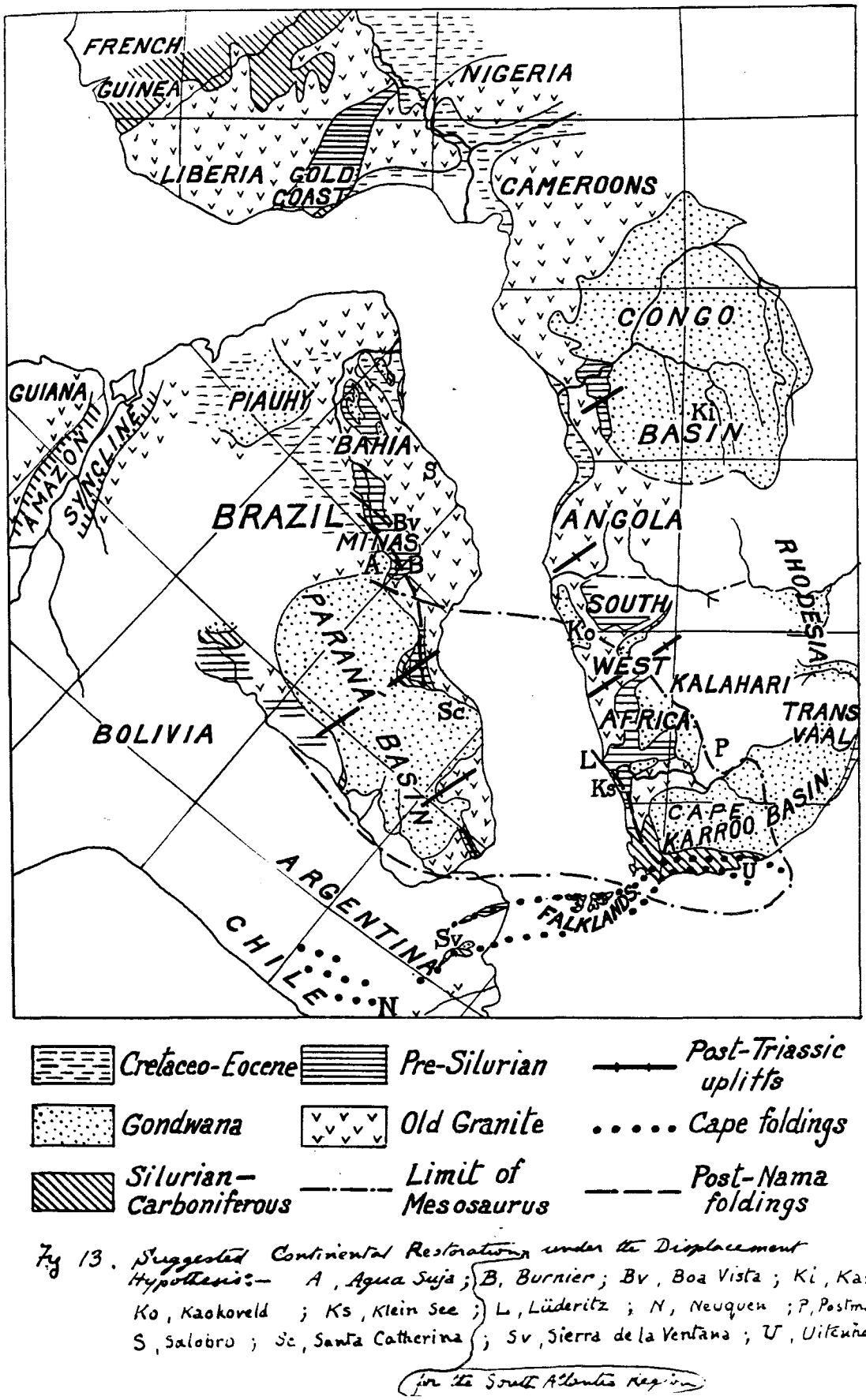


Fig 13. Suggested Continental Restoration under the Displacement Hypothesis:– A, Agua Suja; B, Burnier; Bv, Boa Vista; Ki, Kasai; Ko, Kaokoveld; Ks, Klein See; L, Lüderitz; N, Neuquen; P, Postmasburg; S, Salobro; Sc, Santa Catherina; Sv, Sierra de la Ventana; U, Uitenhage.
for the South Atlantic Region

Figure 3. *First detailed geological comparison between Africa and South America by A.L. du Toit (reproduced with permission from the University of Cape Town Archives). This figure was later published in his presidential address to the Geological Society of South Africa (du Toit, 1928). Of interest to note is that du Toit placed the Falkland Islands against the western extremity of the Cape Fold Belt and not, as is presently favoured, against the eastern extremity of this belt. There is still debate about the correct position of these islands (see, for example Trouw and de Wit, 1999; Turner, 1999).*

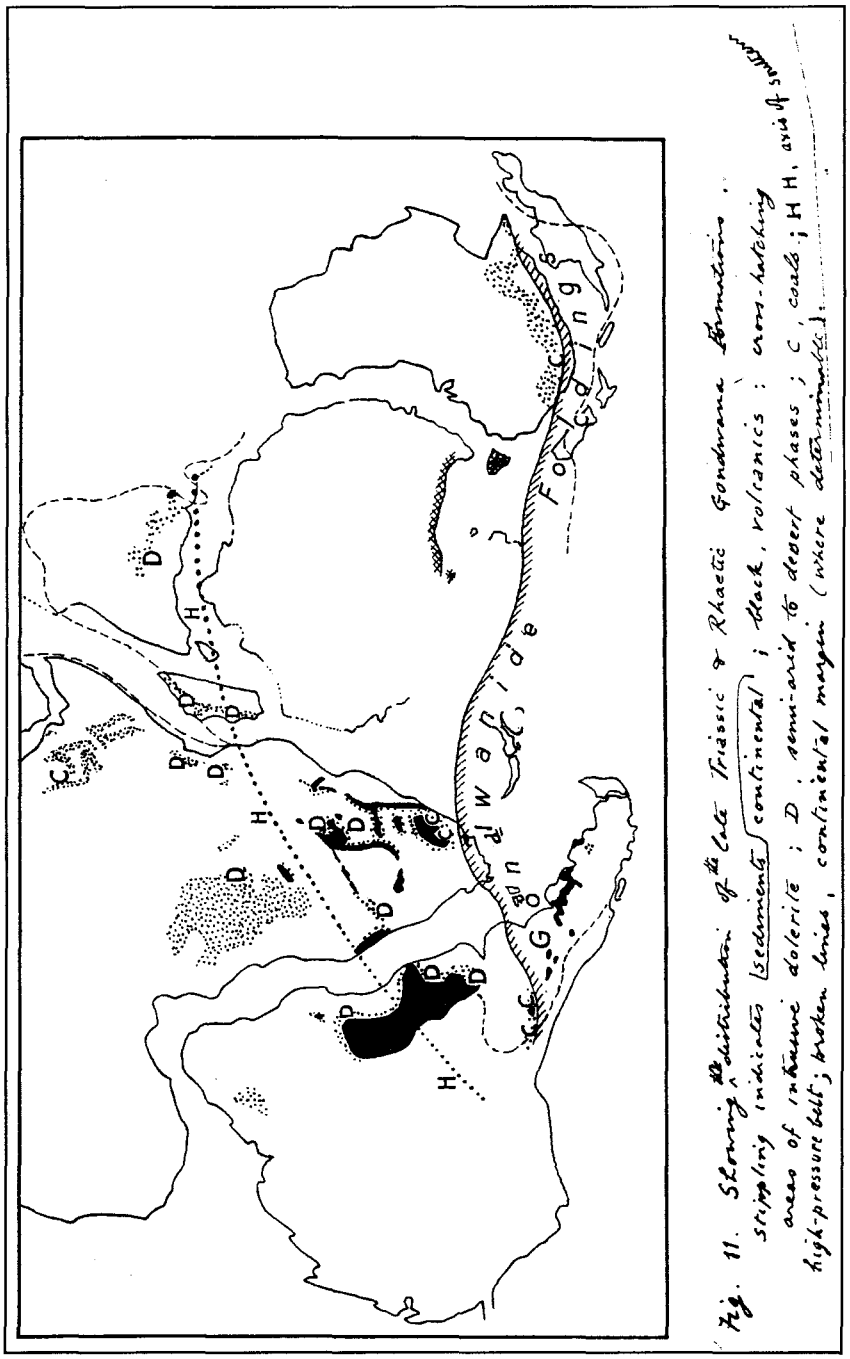


Figure 4. *First detailed geological correlation between the volcanic sequences of south-central Gondwana, by A.L. du Toit (reproduced with permission from the University of Cape Town Archives). This figure was later published in his book 'Our Wandering Continents' (du Toit, 1937). These volcanic rocks are, however, now known to belong to two separate periods of volcanic outpourings (181 Ma and 132 Ma in Southern Africa/Antarctica and South American/Namibia, respectively), and today are commonly related to mantle plume activity (see Hawkesworth* et al., *1999).*

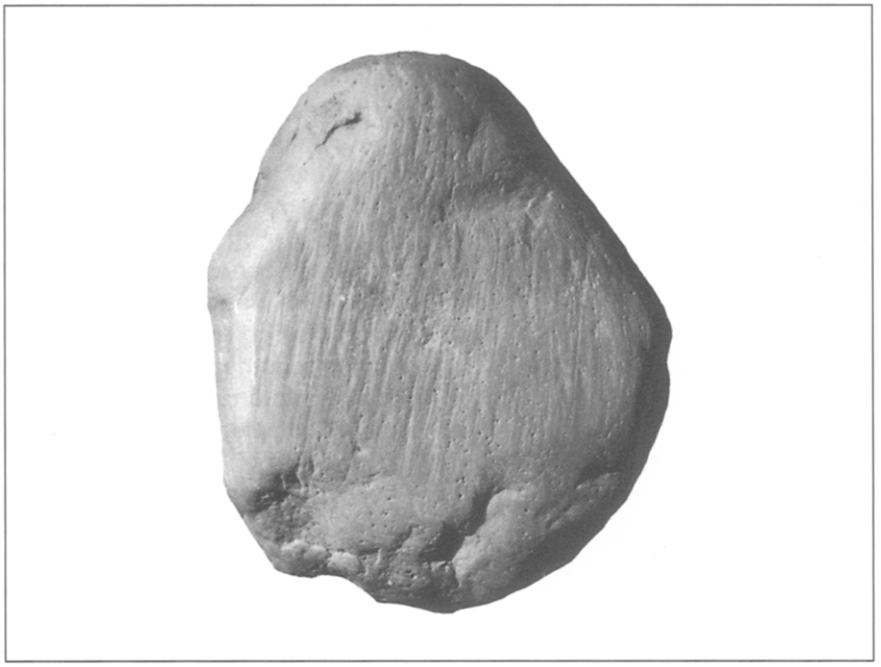


Figure 5. *One of the climate indicators collected by du Toit to support his ideas on Gondwana stratigraphy and continental drift (reproduced with permission from the University of Cape Town Archives). This figure was later published in his 'Geology of South Africa' (du Toit, 1926) long before it was accepted that the deposits with these striated pebbles provided indisputable evidence for extensive glaciation in the southern hemisphere during the Permo-Carboniferous.*

words: "For explanation I am advocating in all seriousness, the view, revolutionary and heretical as it will appear to the orthodox geologist...that the land-fragments still preserved represent portions of the ancient continent forcibly torn apart..." He expressed his beliefs with greater assurance in his 1928 Presidential Address to the Geological Society of South Africa when he wrote: "I am convinced that time will prove the general correctness of these ideas" (see Fig. 4).

THE DRIFT CONTROVERSY

It is of profound significance to appreciate that for the whole of his working life du Toit laboured to promote an acceptance of drift in an international scientific climate of opinion that was almost entirely set against the hypothesis. Thus, for example, Gevers, his biographer, while striving to present an objective view could not resist the temptation to enter the debate and offered the view that "the theory of continental drift probably has passed its zenith. It may eventually be entirely rejected". This pessimistic prognosis was made 12 years after du Toit had set out his views of Laurasia, Gondwanaland and the Tethys in his book 'Our Wandering Continents' (du Toit, 1937).

The reasons for the almost universal abhorrence of the theory of drift during, and immediately following, du Toit's lifetime are not hard to find. The contrasts between continental and oceanic crustal profiles were still to be revealed, thus allowing what now appears to be wildly extravagant excursions into land bridges and intercontinental geosynclines. The mid-ocean ridge system was unknown and no palæomagnetic data were available. No convincing sources of energy had been identified that could possibly account for the fragmentation of a supercontinent. But perhaps of greatest importance is the fact that the bulk of opinion-forming scientists resided in the northern hemisphere and had little, if any, first-hand knowledge of the geology that had so profoundly influenced du Toit's thinking. In this connection it is pertinent to remember that the glacial origin of the Dwyka diamictites was only widely accepted in the late twenties following the International Geological Congress held in South Africa (Fig. 5).

ACCEPTANCE OF CONTINENTAL DRIFT

Within seven years of du Toit's death all this had begun to change. Oceanic and continental crustal

Figure 6. *Reproduced from the 'Life and work of Dr Alex L du Toit', by Gevers (1949).*

contrasts had been revealed and two independent developments had occurred which led to a paradigm shift in geoscientific thinking. Harry Hess at Princeton hosted, on separate occasions in the mid-fifties, two speakers in his Department. The author was fortunate to be present on both occasions and well remembers their impact. Hess had, with Vening-Meinesz, pioneered gravity work at sea, using Dutch submarines to provide stable platforms, and had defined the great negative anomalies associated with deep trenches and island-arcs. His wartime observations of guyots had suggested lateral movements of oceanic crust. The first of his guest speakers was Stanley Runcorn who presented the results of palæomagnetic studies of basalts flanking the North Atlantic and whose reconciliation of their polar wandering paths shook the establishment to its core. The second was Bruce Heezen of Maurice Ewing's Lamont team who revealed for the first time the continuity of mid-ocean ridges. Hess had, over a period of years, serious objections to drift. These two presentations changed his opinion and led within a few years to his benchmark paper on sea-floor spreading. Any lingering doubts were finally dispelled by the interpretation of magnetic signatures in the eastern Pacific crust, the whole saga climaxing with the plate theory of Oliver, Isacks and others.

But tragic as it was that du Toit did not live to see his faith in drift vindicated, he left behind him a legacy that pervades South African geoscience to this day. He was a holistic scientist and the last and greatest of generations of generalists capable of drawing together the many facets of South Arican geology into a text, the third edition of which was virtually complete at the time of his death in 1948.

In summary it is worth recalling something that Gevers said many years ago and to which he refers, in part, in his biography of du Toit (Geevers, 1949). One evening while listening to music on du Toit's ancient gramophone (du Toit was an accomplished musician; Fig. 6), Gevers could not refrain from commenting on the scratchiness of the recording. To which du Toit replied: "don't worry about the noise, listen to the music". This is a very revealing comment coming from a man who was able to create marvellous images from a wealth of often noisy detail.

Finally, a personal note. In his account of du Toit the man, Gevers (1949) wrote that: "It did not make the slightest difference to Alex... whether his visitor or the person to whom he was introduced was a world-famous scientific celebrity or a first-year student". The author can vouch for that because when he first visited du Toit in his Pinelands home the author was a schoolboy and du Toit devoted an afternoon to him in his study without at any time giving the impression that his time was precious and could possibly be devoted to more important matters. This was not long before his death and he must have known that he was not a well man. He was utterly self-effacing and yet possessed a scientific acumen, coupled with a mental and physical vitality, which allowed him to stamp an indelible mark on international geoscience.

Editor's Note

An extensive collection of papers, manuscripts and correspondence of Alex Logan du Toit is kept at the Manuscripts and Archives Department of the University of Cape Libraries. Those interested in learning more about this can view the University of Cape Town website: http://www.uct.ac.za/dets/library/brnchlib/manu/main.htm

The editor would like to thank both Lesley Hart and Karen Combrinck for their friendly and expert

help in searching for material from this collection for use in this article.

REFERENCES

Du Toit, A.L., 1926. Geology of South Africa (and later editions). Oliver and Boyd, Edinburgh, 447p.

Du Toit, A.L., 1928. Some reflections upon a geological comparison of South Africa with South America. Proceedings Geological Society South Africa. Presidential Address, pages 19–38.

Du Toit, A.L., 1937. Our Wandering Continents. Oliver and Boyd, Edinburgh, 366p.

Gevers, T.W., 1949. The life and work of Dr Alex L. du Toit. Transactions Geological Society South Africa 52, 109p.

Hawkesworth, C. Kelley, S., Turner, S., le Roex, A., Storey, B., 1999. Mantle processes during Gondwana break-up and dispersal. Journal African Earth Sciences 28, 239–261.

Trouw, R.A.J., de Wit, M.J., 1999. Relation between the Gondwanide Orogen and contemporaneous intercratonic deformation. Journal African Earth Sciences 28, 203–213.

Turner, B.R., 1999. Tectonostratigraphical development of the Upper Karoo foreland basin: orogenic unloading versus thermally-induced Gondwana rifting. Journal African Earth Sciences 28, 215–238.