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5 December 2015

Project Reference: 710.19057.00001

Ms Caitlin Hird
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Dear Ms Hird,

Palaeontological Desktop Study – Siyanda Chrome Smelting Company Pty. Ltd

As requested, herewith a Desktop Palaeontological Impact Assessment with regard to the proposed Siyanda chrome smelter near Northam in the Limpopo Province. My cv is attached as Appendix 1.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'B. Rubidge'.

Bruce Rubidge PhD, FGSSA, FRSSA, Pr Sci Nat

**PALAEONTOLOGICAL DESKTOP STUDY
SIYANDA CHROME SMELTING COMPANY,
THABAZIMBI LOCAL MUNICIPALITY, WATERBERG DISTRICT, LIMPOPO
PROVINCE**

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DATE: 5 December 2015

EXECUTIVE SUMMARY

A desktop Palaeontological Impact Assessment was undertaken for Siyanda Chrome Smelting Company (SCSC) which is to be developed in the western area of portion 3 of the farm Grootkuil 409 KQ, northwest of Northam in the Thabazimbi Local Municipality in the Waterberg District Municipality, Limpopo Province. The proposed development is to set up a new ferrochrome smelter.

The entire study area is underlain by rocks of the Precambrian Bushveld Igneous Complex. There is a slight, but unlikely, possibility that in low lying areas there may be Quaternary alluvial deposits which could contain fossils.

In my opinion this development will not negatively affect palaeontological heritage. If, in the extremely unlikely event that fossils are exposed in Quaternary alluvial deposits in the process of development activities, a qualified palaeontologist must be contacted to assess the exposure for fossils so that the necessary rescue operations are implemented.

NEMA Regulation (2014), Appendix 6

NEMA Regulations (2014) - Appendix 6	Relevant section in report
Details of the specialist who prepared the report.	See Appendix 1 – CV of specialist
The expertise of that person to compile a specialist report including curriculum vitae.	See Appendix 1 – CV of specialist
A declaration that the person is independent in a form as may be specified by the competent authority.	See Declaration of Independence (page 6)
An indication of the scope of, and the purpose for which, the report was prepared.	Background of development (page 8)
The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Not applicable - Desktop study
A description of the methodology adopted in preparing the report or carrying out the specialised process.	See Methodology (page 10)
The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	See Geological Setting (page 10)
An identification of any areas to be avoided, including buffers.	See Palaeontological Heritage (page 11)
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	See Figure 1
A description of any assumptions made and any uncertainties or gaps in knowledge.	See Limitations and Uncertainties (page 12)
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment.	See Palaeontological Heritage (page 11)
Any mitigation measures for inclusion in the EMPr.	See Recommendations (page 12)
Any conditions for inclusion in the environmental authorisation	See Recommendations (page 12)
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	See Recommendations (page 12)

A reasoned opinion as to whether the proposed activity or portions thereof should be authorised.	See conclusion (page 12)
If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan.	See conclusion (page 12)
A description of any consultation process that was undertaken during the course of carrying out the study.	Consultation with interested and affected parties was undertaken as part of the environmental impact assessment and environmental management programme process conducted by SLR Consulting (Africa) (Pty) Ltd. Relevant issues were considered as part of the study.
A summary and copies if any comments that were received during any consultation process.	No comments received related to palaeontology
Any other information requested by the competent authority.	None

Declaration of Independence

I, **Prof Bruce Rubidge** (PhD, FGSSA, FRSSA, Pr Sci Nat) , declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the relevant legislation and any guidelines that have relevance to the proposed activity;
- I will comply with the applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct



BS Rubidge

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REPORT

Background Information of the development

This desktop report is part of a Heritage Impact Assessment to determine the effect of the proposed new ferrochrome (FeCr) smelter on portion 3 of the farm Grootkuil 409 KO, in the Thabazimbi Local Municipality in the Waterberg District Municipality, Limpopo Province. The project will comprise a railway siding, a raw materials offloading area, two 70 MW DC furnaces, crushing and screening plant, slag dump and baghouse slurry dam, and related facilities such as material stockpiles, workshops, stores and various support infrastructure and services including powerlines and pipelines. The study was commissioned by SLR Consulting (Africa) Pty Ltd. and I was asked to provide a desktop assessment of the effect that the proposed development will have on the palaeontological heritage.

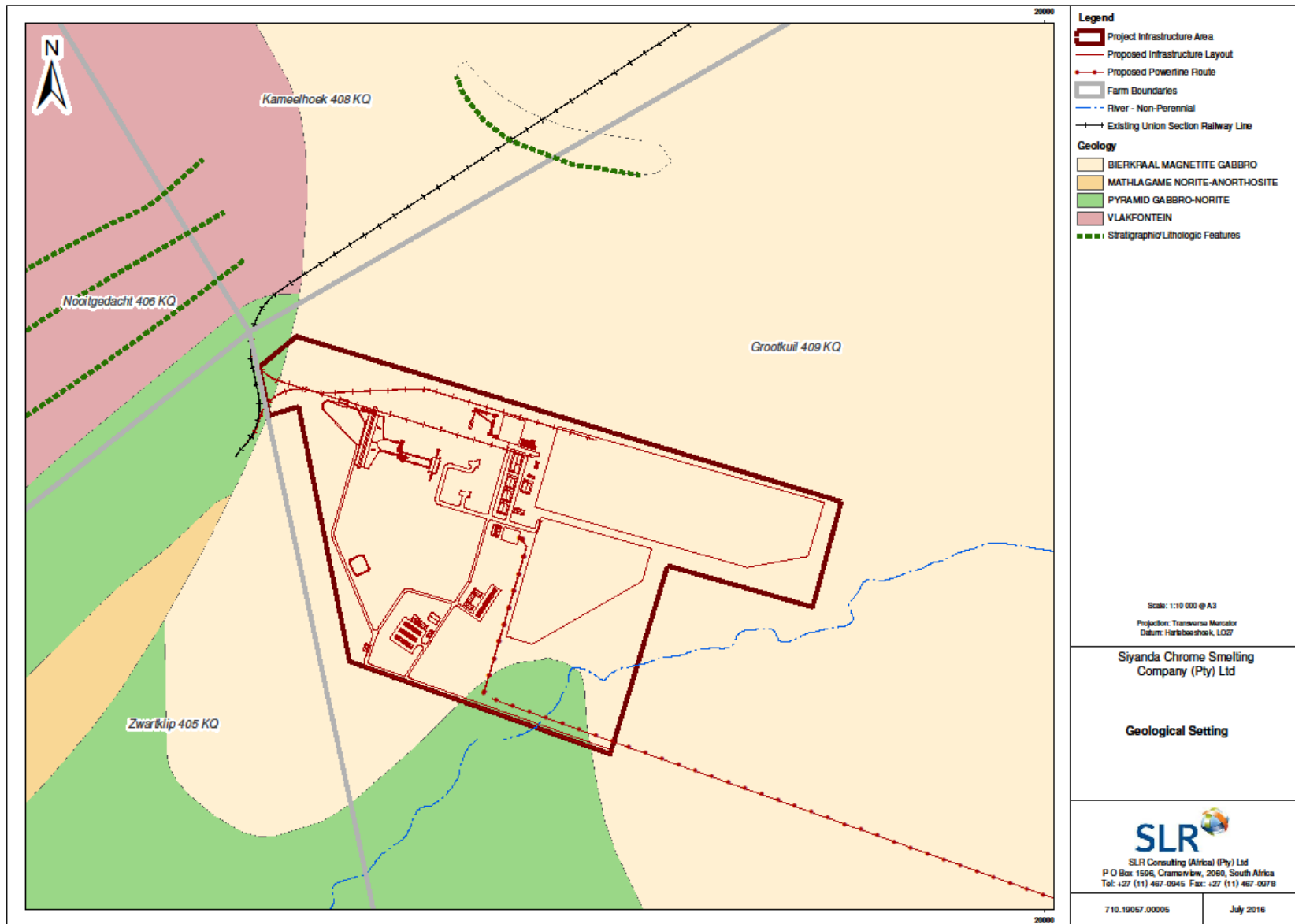


Figure 1: 1:50 000 Map showing the position of the proposed new ferrochrome (FeCr) smelter on portion 3 of the farm Grootkuil 409 KO, in the Thabazimb Local Municipality in the Waterberg District Municipality, Limpopo Province (Map Sheet 2427CC).

Details of the study area

The study area for the proposed project (shown above in the Local Setting) is located approximately 5 km north west of Northam, in the Thabazimbi Local Municipality which falls in the Waterberg District Municipality. Based on current planning it is expected that the smelter infrastructure will be located immediately adjacent to the existing Union Section Mine on property owned by SCSC. Included in the study area is the proposed access road as well as the proposed powerline which will be developed for the purposes of the project.

Methodology

This desktop study was undertaken by superimposing the study area on the published 1:250 000 geological map of the area (1:250 000 geological map 2624 Thabazimbi, Government Printer 1974). Utilising a combination of background knowledge and literature of known palaeontological resources and the geological horizons in which they occur, a conclusion was reached as to the likelihood of the development having any impact on palaeontological resources.

Geological Setting

The entire area is underlain by gabbros and norites of the Precambrian Bushveld Igneous Complex. Although not indicated by the geological map (1:250 000 geological map 2624 Thabazimbi, Government Printer 1974) below there is a possibility that low lying areas are covered by Quaternary alluvial deposits (Figure 2).

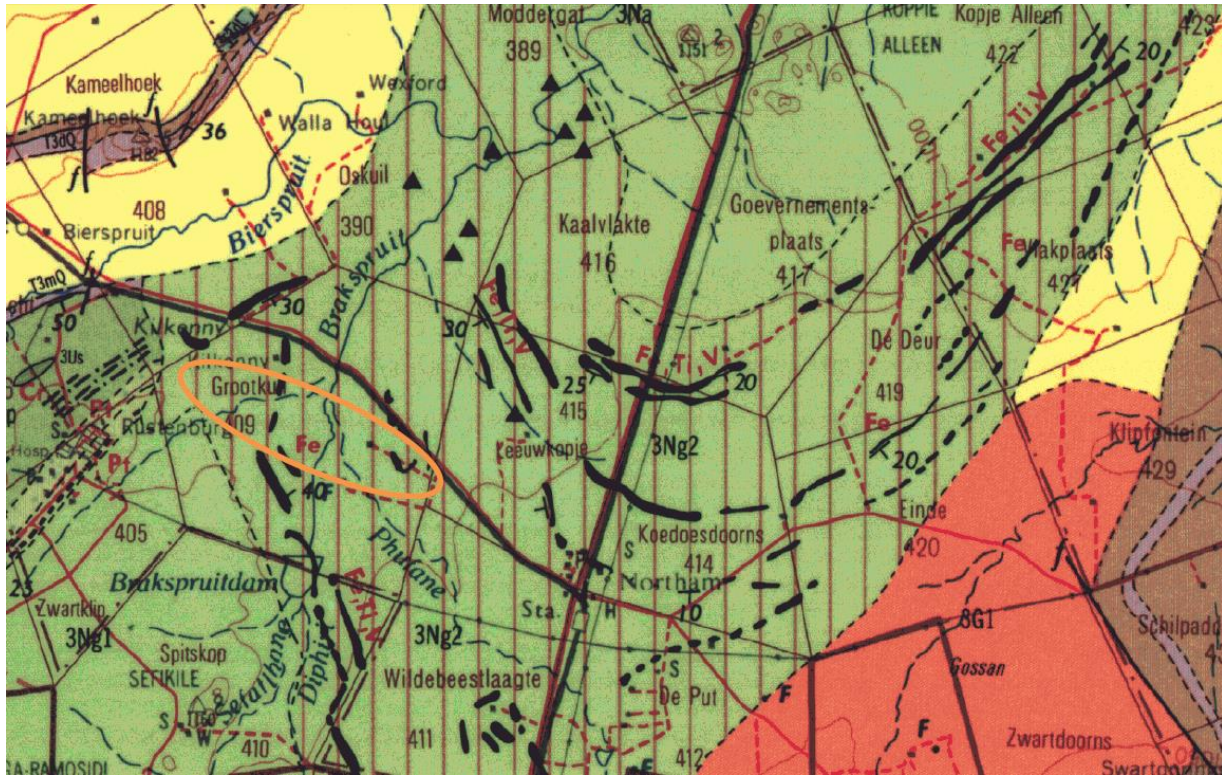


Figure 2: Geology of the Study area (1:250 000 Geological Map Series of the Republic of South Africa, Sheet number 2426 Thabazimbi, Government Printer 1974) (Red ovoid shows study area).

Palaeontological Heritage

As the rocks of the Bushveld Complex are of igneous origin there is no possibility of fossils being present. There is a slight, but very unlikely possibility that fossils could be present in Quaternary alluvial deposits present in low-lying areas. The impact assessment summary below is therefore relevant. Given the very low likelihood of palaeontological resources being found within the project area, both the unmitigated and mitigated significance is expected to be low.

Unmitigated – summary of the rated visual impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
All phases						
Unmitigated	L	M	L	L	L	L

Mitigated – summary of the rated visual impact per phase of the project

Management	Severity / nature	Duration	Spatial scale / extent	Consequence	Probability of Occurrence	Significance
Construction, operation and decommissioning						
Mitigated	L	L	L	L	L	L
Closure						
Mitigated	L	L	L	L	L	L

Limitations and Uncertainties

This report is based on a desktop study combining the use of geological maps and background knowledge of the stratigraphic occurrence of fossils. As the study area was not visited there is a possibility that the presence of fossil-bearing rock formations have been overlooked. This is highly unlikely, but a mitigation clause has been included in the recommendation.

Recommendation

Because of the nature of the construction of smelter developments it is extremely unlikely that the proposed new ferrochrome (FeCr) smelter development on portion 3 of the farm Grootkuil 409 KO, in the Thabazimbi Local Municipality in the Waterberg District Municipality, Limpopo Province will have any impact on palaeontological heritage. However if fossils are exposed in Quaternary alluvial deposits it will create a unique opportunity to explore the area for fossils. It is thus recommended that, in the unlikely event that fossils are exposed as a result of construction activities, a qualified palaeontologist should be contacted to assess the exposure for fossils before further development takes place so that the necessary rescue operations are implemented. Depending on the nature of the fossils discovered this could entail excavation and removal to a registered palaeontological museum collection. A list of professional palaeontologists is available from South African Heritage Resources Agency (SAHRA).

Conclusions

The proposed development of the ferrochrome (FeCr) smelter and related linear infrastructure will extend over Precambrian rocks of the Bushveld Igneous Complex and possibly Quaternary alluvial deposits. It is extremely unlikely that fossils will be exposed as a result of the smelter development. It is considered that, from a palaeontological perspective, the development of the proposed ferrochrome (FeCr) smelter and its related linear infrastructure should proceed, but that if fossils are uncovered in the course of construction activities, the developer should immediately call in a qualified palaeontologist to assess the situation and, if necessary, undertake excavation of the fossils.

Bibliography

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APPENDIX 1:

Bruce Sidney Rubidge

PERSONAL DETAILS

Name:	Rubidge, Bruce Sidney
Date of birth:	1 June 1956
Marital status:	Married to Alida Marina (née Liebetrau) on 17 November 1984
Children:	Sidney Richard (30 October 1988) Mark Lourens (20 September 1990)
Previous position:	Director: Bernard Price Institute for Palaeontological Research, School for Geosciences, University of the Witwatersrand, Johannesburg
Present position:	Interim Director: Evolutionary Studies Institute, & Director: NRF/DST Centre of Excellence in Palaeosciences, University of the Witwatersrand, Johannesburg, Private Bag 3, P.O. Wits. 2050

PROFILE

Apart from my first work-year in 1980, my entire research career has been in positions of research leadership. From 1981 to 1990 I was head of the Karoo Palaeontology Department at the National Museum in Bloemfontein, and since 1990 have been director of the Bernard Price Institute for Palaeontological Research (BPI) at the University of the Witwatersrand, Johannesburg (Wits). Under my directorship the research staff component of the Institute has doubled, the number of postgraduate students has more than doubled, and the research programme of the Institute has greatly expanded. I was closely associated with setting up and fundraising for the Institute for Human Evolution (IHE) at Wits, driving the amalgamation of the Wits palaeontological collections under a single collections curator, and was responsible for planning the expansion and renovation of the building for The Palaeosciences Centre which for the next decade will serve the research and curatorial requirements of the newly established Evolutionary Sciences Institute (ESI) (a recent amalgamation of the BPI and IHE). Being passionate to expose the remarkably diverse palaeoheritage of South Africa to the public, I was involved in the development of the Cradle of Humankind World Heritage site, and also in setting up the Kitching Fossil Exploration Centre as a sustainable business in the Karoo town of Nieu Bethesda. On an annual basis I teach at least two palaeontology courses to undergraduate students, 3 courses to honours students and am involved in the supervision of MSc and PhD graduates.

Although I have administered and sponsored research on the Cenozoic fossil hominid sites in the Cradle of Humankind and have supervised postgraduate geology and palaeontology students researching the Devonian rocks of the Cape Supergroup, most of my research has been on projects relating to the palaeontology, sedimentology, stratigraphy and basin analysis of the Permian-Jurassic Karoo Supergroup. In the process, I have attempted to stimulate international research collaboration

on the Karoo and its fossils, and as a result have ongoing collaborations with palaeoscientists involved in research on Karoo-aged rocks on all continents of the world. The Karoo fauna is of global interest as southern Africa occupied a central place in Gondwana, and the fossils found in the time-extensive Karoo Supergroup have a global distribution. Recently I and collaborators have published the first radiometric dates for the Permian biozones of the Beaufort Group, a development which will have important consequences for dating tetrapod-bearing Permian deposits from around the world, timing for basin modelling, as well as determining the rate of evolutionary development in Permian tetrapods.

My current research speciality is to understand biodiversity changes in the lowermost Beaufort Group (Abrahamskraal Formation). This Formation comprises the most complete fossil-bearing Middle Permian terrestrial succession and is one of the only places in the world able to provide evidence for the effect of the end Guadalupian mass extinction (recently noted in the marine realm) on land. For three decades my collaborators and I have undertaken stratigraphic fossil collecting and documentation of the 3000 m thick Abrahamskraal Formation at various localities around the Karoo basin; in the process, we have described more than 10 ten new basal tetrapod species, discovered a new and older faunal biozone, as well as undertaking taxonomic and phylogenetic research on the tetrapod faunas. Because of the complicated structural geology of the southern Karoo and the relative paucity of fossils in these lower horizons, research progress was at first slow as it was difficult to build up large and representative numbers of specimens. Now, however, trends are beginning to emerge around the basin and shortly we will be publishing the first accurate stratigraphic ranges of Middle Permian tetrapod taxa, presenting diversity trends, and proposing a new basin development model for the Abrahamskraal Formation. These findings will have international importance as they will be the first accurate representations for understanding Middle Permian biodiversity changes in the terrestrial realm.

VOCATIONAL QUALIFICATIONS

1988	PhD (Geology/Palaeontology), University of Port Elizabeth
1983	MSc (Palaeontology) cum laude, University of Stellenbosch
1979	BSc Honours (Palaeontology) cum laude, University of Stellenbosch
1975–1978	BSc (Zoology and Geology), University of Stellenbosch

PROFESSIONAL EXPERIENCE

2013-	Interim Director: Evolutionary Studies Institute, & Director: NRF/DST Centre of Excellence in Palaeosciences,
2001–2013	Director of Bernard Price Institute for Palaeontological Research, University of the Witwatersrand, Johannesburg
2001–2002	Deputy Dean (Research), Faculty of Science, University of the Witwatersrand, Johannesburg
May 1990– 2000	Director of Bernard Price Institute for Palaeontological Research & Head of Palaeontology Department, University of the Witwatersrand, Johannesburg

1992–1993	Consultant on Beaufort Biostratigraphy for the Atomic Energy Corporation Uranium Exploration Programme
August 1988	Consultant on Palaeontology for ERL in the Environmental Division of the Lesotho Highlands Development Authority
Jan 1981–Apr 1990	Head of Department of Karoo Palaeontology, National Museum, Bloemfontein
Apr 1980–Dec 1980	Associate curator of Karoo Palaeontology, National Museum, Bloemfontein

MEMBERSHIP OF PROFESSIONAL SOCIETIES

- Sedimentology Division of the Geological Society of SA: *Executive Committee, 1991–1997; Chair, 1997*
- Institute for the Study of Man in Africa: *Executive Committee, 1991–1997*
- Palaeontological Society of Southern Africa: *Vice President, 1990–1992; President, 1992–1994; Immediate Past President, 1994–1996; President, 2004–2006; Immediate Past President, 2006–2008*
- Geological Society of Southern Africa: *Fellow; Committee of Orange Free State Branch of Geological Society of Southern Africa, 1984–1990; Conservation Committee, 1996–2002*
- Royal Society of South Africa, *Fellow*
- Zoological Society of Southern Africa, *Fellow*
- Herpetological Association of Southern Africa, *Member*
- Southern African Museums Association, *Member 1992–2001*
- Archaeological Society of Southern Africa, *Patron, 1992–*