

**Case ID: 7492**

Application for an Export Permit for "CT-scanning at Grenoble – dentine rings"

Case Officer: Ragna Redelstorff

The proposal should include

- a list of participants (name, affiliation, phone no, email addresses) and how they are involved;
- the name and address of the facility, including address, it is being scanned at;
- name and address of the museum/university department that currently hosts the object;
- names of the responsible person(s) during transport and while the fossil is at the facility;
- the period/time frame during which the fossil(s) will be outside the country;
- detailed information on the fossil(s), especially as it is a "unique" specimen;
- detailed information on the research project behind it & methodology including expected outcomes (i.e., the reason for export);
- the written confirmation of the institution that currently hosts the object that the object may be used as proposed and be returned in good condition;
- should there be any damage/destructive analysis (e.g., coating for higher resolution) undertaken, this needs to be stated in detail;
- Statement why this study cannot be done in South Africa.

**Applicant:**

Dr. Heidi Fourie (heidicindy@yahoo.com)

Curator: Karoo Section

Department of Vertebrates

Ditsong Museums of South Africa

70 WF Nkomo Street, Pretoria

Phone: 012 000 0010

**Applied for (principal researcher):**

Dr. Fernando Abdala (nestor.abdala@wits.ac.za)

Evolutionary Studies Institute

University of the Witwatersrand

Johannesburg

South Africa

[www.losabdala.com/fernando](http://www.losabdala.com/fernando)

**Participants (& their role):**

- 1) Dr Vincent Fernandez: ESRF - The European Synchrotron, Grenoble, France;  
Phone 033 4 76 88 20 00; vinfermand@gmail.com
- 2) Dr Fernando Abdala: Reader, Evolutionary Studies Institute, University of the Witwatersrand;  
Phone 0027 11 7176687; nestor.abdala@wits.ac.za.
- 3) Dr Bruce Rubidge: Professor, Evolutionary Studies Institute, University of the Witwatersrand;  
Phone 0027 11 7176685; bruce.rubidge@wits.ac.za

The material will be transported to France in June 2015 by Fernando Abdala/ hand-carried by Prof. B.S. Rubidge and brought back by Dr. F. Abdala.

All the authors will be involved with the analysis and interpretation of data and in the writing and publication of the results.

**Institution that currently hosts the object:**

Museums of South Africa, Karoo Section, Department of Vertebrates Loan is valid for 6 months.

**Facility at which the experiment will be done:**

ESRF, 71 avenue des Martyrs, 38000 Grenoble, France

**Fossils:**

Collection No	Taxon	Skeletal element	Photo label
TM180	<i>Thrinaxodon</i>	Cranium	TM180D_Thrinaxodon_cranium_lower_jaw_dorsal TM180V_Thrinaxodon_cranium_lower_jaw_ventral
TM180	<i>Thrinaxodon</i>	Lower jaw	TM180D_Thrinaxodon_cranium_lower_jaw_dorsal TM180V_Thrinaxodon_cranium_lower_jaw_ventral

**Time frame:**

Transport to France: June 2015

Return date: to be confirmed

**Aim/rationale:**

The aim of the project is to perform a detailed study of the teeth microstructure of burrowing mammal-like reptiles (such as *Thrinaxodon*) to understand their adaptations facing the dramatic climatic modifications of the Early Triassic (-252 Million years ago). As these mammal-like reptile were replacing their teeth throughout their live, the rapid mineralization of the bony part of their teeth (the dentine) was affected by environmental variation and metabolic strategies to survive critical part of the year (drought). For each different individual we have the opportunity to assess the stress from the environment at various period of their growth. It will allow us to get new information regarding their thermophysiology (if they were cold-blooded or warm-blooded animals) and if they were experiencing long torpor during periods of drought (called, aestivation, the summer counterpart of hibernation): If the animals were indeed aestivating as it is suggested by many studies, the mineralization of teeth completely stopped during these periods and it will be visible by line of arrested growth. This study will permit to clarify whether or not this animal were using this.

**Methodology:**

Scanning specimens using non-invasive X-ray synchrotron propagation phase contrast microtomography in order to study teeth microstructure. The specimen does not need any sort of special preparation, it will be place on a slow rotating sample stage (about 10 minutes for 360 degrees rotation). Synchrotron as a source of X-ray is needed to provide enough signal for the submicronic resolution required and also to make use of the specific properties of the synchrotron beam (coherence) to use phase contrast imaging. The latter allows the enhancement of contrast, essential to observe the smallest density variation within the sample.

**Confirmation/permit by museum:**

See document SAHRAExportThrinaxodon

**Damage/destructive analysis?**

NA

**Statement why this study cannot be done in South Africa:**

A scanning facility that provides the same high resolution as the Synchrotron facility in Grenoble does not exist in South Africa.