

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office via the User Portal: <https://www.esrf.fr/misapps/SMISWebClient/protected/welcome.do>

Deadlines for submission of Experimental Reports

Experimental reports must be submitted within the period of 3 months after the end of the experiment.

Experiment Report supporting a new proposal (“relevant report”)

If you are submitting a proposal for a new project, or to continue a project for which you have previously been allocated beam time, you must submit a report on each of your previous measurement(s):

- even on those carried out close to the proposal submission deadline (it can be a “*preliminary report*”),
- even for experiments whose scientific area is different from the scientific area of the new proposal,
- carried out on CRG beamlines.

You must then register the report(s) as “relevant report(s)” in the new application form for beam time.

Deadlines for submitting a report supporting a new proposal

- 1st March Proposal Round - **5th March**
- 10th September Proposal Round - **13th September**

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report in English.
- include the experiment number to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.



	Experiment title: Late Mesozoic eutherian mammals: Paleoanatomy and paleophysiology inferred from teeth and bone	Experiment number: ES-1154
Beamline: BM05	Date of experiment: from: 02.03.2022 to: 07.03.2022	Date of report: 04.03.2023
Shifts: 15	Local contact(s): Dr Kathleen Dollman and Dr Kudakwashe Jakata	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): *Dr Łucja Fostowicz-Frelik, Institute of Paleobiology, Polish Academy of Sciences, Warsaw, Poland *Dr Katarzyna Janiszewska, Institute of Paleobiology, Polish Academy of Sciences, Warsaw, Poland *Mr Pawel Muniak, Department of Biology, Jagiellonian University, Kraków, Poland (currently Faculty of Natural Sciences and Technology, University of Opole, Opole, Poland) Prof. Zhe-Xi Luo, Department of Organismal Biology and Anatomy, University of Chicago, Chicago, IL, USA.		

Report:

During our experiment we scanned the crania, mandibles, and postcranial elements of the Late Cretaceous Eutherian mammals. The scans were executed at the resolution of 5.49, 0.73, and 0.35 μm , and included imaging of whole objects as well as scanned sections of bones and teeth; in the latter performed at the enamel-dentine junction.

Originally, 14 crania or skull fragments, 10 mandibles, and five postcranial skeleton fragments were scanned. After the scan reconstruction we obtained data for 10 crania, eight mandible fragments, and three postcranial bones, the remaining data were either not reconstructed or the scans crashed and the data were lost.

We have no data from the scans performed at the highest (0.35 μm) resolution, although seven teeth were scanned. We were informed that the data could not be reconstructed due to some error that occurred during data acquisition (lack of some of the projection files).

The scans performed at resolution of 0.73 μm included 27 teeth (premolars, molars and incisors) and data were reconstructed with success, although some of them have strong ring-like artifacts.

The planned research had multiple goals; we intended to reconstruct the intracranial morphology in Asioryctitheria and Zalambdalestidae, including brain and inner ear endocasts, turbinal morphology (if present) and dental exchange process. Furthermore, the scanning at the 0.73 and 0.35 μm was planned to study the tissue incremental lines (in bones and teeth) for reconstructing the growth tempo and implications on the animal's lifespan and possibly, on metabolic tempo in those organisms. Moreover, we planned a detailed study of the dentition, featuring the dental exchange and tooth formation in Cretaceous Eutheria.

We obtained the reconstructed files in mid-July, 2022. In order to work with the data on our equipment at the Luo Lab (The University of Chicago, IL, USA) we needed to adjust the format and size of the scans.

The first task undertaken by our team was the study of dental replacement. We segmented the dentition in two specimens of juvenile eutherian genera (see Fig. 1), which show the dental exchange in progress.

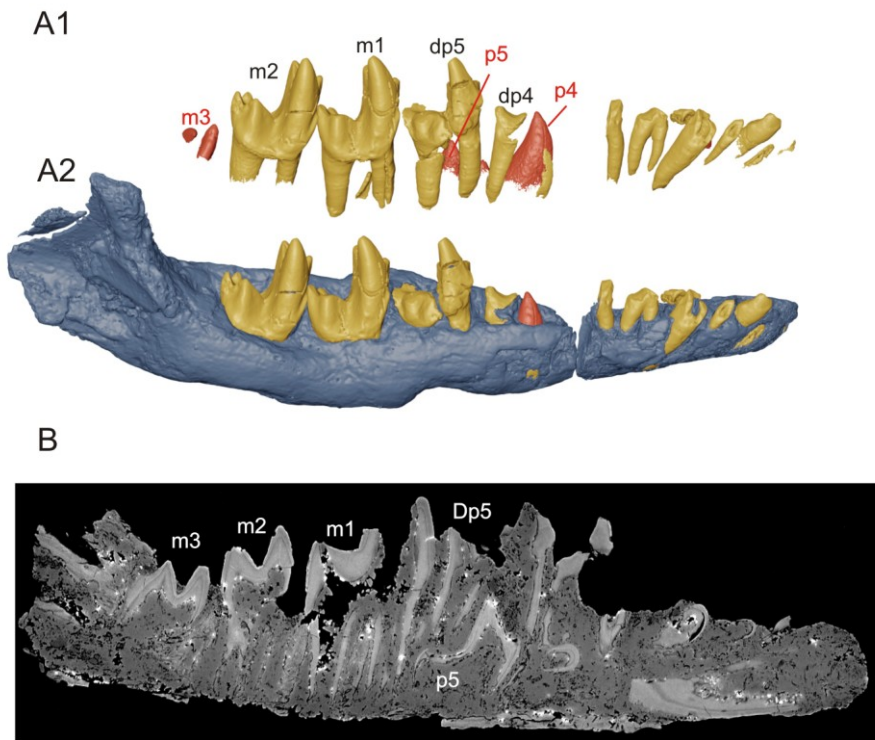


Fig. 1. Dental exchange in progress in eutherian mammals: *Kennalestes* (A) and *Barunlestes* (B)

This is the first ever visualization of the dental eruption in progress in *Kennalestes* and *Barunlestes*, showing a typical exchange pattern for placental mammals.

This is a preliminary report, as we have not not able to process the data and publish our work in about seven months. However, the paper communicating our results is currently under preparation.