

Research Proposal to scan non-hominin primate teeth from Drimolen and one fragmentary midshaft at the Italian Synchrotron Facility in Trieste, Italy.

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Introduction

With the advent of high resolution X-ray synchrotron propagation phase contrast microtomography (SR-mCT), a powerful analytical technique has recently become available for palaeontologists. The possibility of using a synchrotron source optimised for hard X-rays, instead of conventional sources, increases dramatically the investigative potential. X-ray beams used for X-ray synchrotron microtomography (SR- μ CT) present three main properties that enhance significantly the data quality and the imaging possibilities: the monochromaticity, the high beam intensity and the partial coherence. This technique has already been applied successfully to the analysis of important fossil materials from the site of Drimolen. The SR-mCT has allowed, for example, the detailed analysis of dental microstructure of early fossil hominins from South Africa and Neandertal specimens.

Aims

The aim of the project is to explore the multidisciplinary Synchrotron Light Laboratory ELETTRA (beamline BL 6.1 R Synchrotron Radiation for Medical Physics (SYRMEP)) presently available in Italy, at Trieste, to analyze in detail the dental microstructure of **non-hominin** fossil primate specimens recovered from the Pleistocene fossil site of Drimolen. This collaborative project aims at developing a specific analytical protocol for palaeontological collections that can be used for future high profile studies on the dental microstructure of fossil hominin specimens from South Africa. As this beamline has conducted few studies at present of fossils, we would like to take a few isolated, unpublished fossil *Papio* specimens instead of hominin fossils to test beamline BL 6.1. This will allow us to ascertain whether the beamline can conduct the detailed imaging necessary for studies of dental histology. As the Drimolen Research Project has had a long standing collaboration with the University of Florence and the University of Pisa, accessing the Italian Synchrotron facility is easier than that of the Grenoble. We have initially chosen taxonomically non-diagnostic specimens for this initial study. In addition we are also applying to export a fragmentary fossil shaft fragment to test the synchrotron's ability for cross sectional histology.

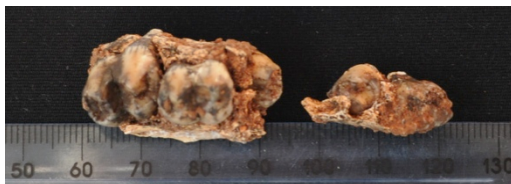
Material requested for export

The following three specimens are requested for export. These specimens will be hand carried to Italy by Professor Jacopo Moggi-Cecchi where they will be deposited in secure (locked) storage until scanning. The specimens will be micro-CT scanned at several resolutions employing both absorption and phase-contrast synchrotron imaging techniques. This technique is non-destructive and provide results that are far superior to that of laboratory micro-CTs.

1. DN 235 – *Papio* sp. - Isolated lower central incisor



2. DN 2428 - *Papio* sp. – A fragmentary maxilla in two pieces. We would like to export only one of the pieces which has an upper M1 in occlusion with an erupting M2 and an unerupted P4. The other piece that we are not requesting includes a worn dm2 and an unerupted P3.



3. DN 2575 – Fragmentary midshaft fragment, 7cm in length. Unidentifiable to taxon.



Return of Material

The material will once again be hand carried. Date of return is late July 2014. This is during Professor Moggi-Cecchi's annual joint excavation at Drimolen with the University of Johannesburg and the University of Florence.