UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

EVOLUTIONARY STUDIES INSTITUTE

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RE: Report on findings from ESRF Experiment ES-275

Dear ESRF Committee,

This brief report summarizes our findings on experiment ES-275, the scanning of a small clutch of fossil dinosaur eggs attributed to *Massospondylus carinatus* from South Africa. Data processing is still ongoing for the specimens, but we have strong indications that the experiment will be a success.

Scanning of the specimens was made especially difficult by their geometry (flattened in the Z-direction), and by a rock matrix of exceptional density. ESRF Beamline technician Dr Vincent Fernandez made a superb effort to both obtain high-quality scans and also to post-process the scan data to eliminate beam hardening artefacts. The results were of excellent quality and relatively easy to segment in digital software such as VG Studio. Our scan time was appropriately targeted, and we were able to additionally make a very high-resolution scan of the long bones for doing non-invasive palaeohistology.

Processing of the scans is being undertaken by Ms Kimberley Chapelle (Wits University, ESI) under the supervision of Prof Jonah N Choiniere. Ms Chapelle has digitally extracted two of the skulls from the embryos and is in the process of extracting a third – there may still be additional cranial material in other embryos. Her preliminary data reflect expected ossification patterns in the skull, such as delayed braincase ossification, and reveal the presence of previously unknown teeth. She will complete the segmentation by July, 2017. It is a time-intensive process, as she has already put in more than 100 hours to the scans.

We are now in the process of investigating the ossification patterns in dinosaurian bracketing groups Crocodylia and Aves, and we will develop manuscripts on comparisons to these taxa as well as a manuscript on the histology of dinosaur embryos.

I anticipate the first publications will be submitted at the end of 2017 and published in 2018.

Sincerely,

Jonah Choiniere

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