Project Motivation

The Gorgonopsia were the "sabre-toothed tigers" of the Permian; medium-sized to large therapsids equipped with unusually elongated canine teeth that were used to bring down large prey.  They were efficient, capable hunters and the dominant predators of the Late Permian terrestrial ecosystem. They form the most basal group of the Theriodontia, a derived group of nonmammalian therapsids which also include the Therocephalia and Cynodontia (the latter of which includes mammals as a derived subgroup). Despite their success as the dominant predators of the Late Permian, the gorgonopsians did not survive the end-Permian mass extinction; the most catastrophic mass extinction in Earth’s history that occurred approximately 252 million years ago. Hypotheses explaining their extinction during this event include large body size, the extinction of their prey base (mostly large dicynodonts), low population levels and/or speciation rates, high trophic levels and specialist habits. However, their biology remains poorly understood due to the paucity of material and a lack of comprehensive morphological and osteohistological studies in a phylogenetic context. More studies on the taxonomy and osteohistology (bone microstructure) of gorgonopsians are crucial for gaining a broader understanding of this group’s evolution and thus possible reasons for their extinction during the end-Permian extinction.

Equipment and Protocol

The National Museum contains a fully equipped osteohistology laboratory with cutting, grinding and polishing machines (Struers Accutom-100; LaboPol 5). Thus, all thin sectioning and analysis of the bone microstructure can be completed in-house. Limb bones will be preferentially selected as they provide the most complete information about the life history of an animal. Photographs, casts and gross measurements of the bones will be taken prior to thin sectioning in order to retain a permanent record of the specimens. In most cases, only a small region of the midshaft of each bone is required to obtain a life history record of the individual. Once all information about the bone has been recorded, the portion of bone to be thin sectioned will be embedded, sections cut, stuck to slides and ground using the Struers Accutom-100 following standard practices. Photographs and osteohistology data (e.g. osteocyte lacuna density, vascularity, bone tissue type, growth marks) will be collected using a Nikon Eclipse Ci-Pol polarizing Microscope and various image analysis software (e.g. NIS elements D 4.5, Image J, Bone Profiler for Windows) all of which are available in the department. Once all analysis is complete, the resulting thin sections will be returned to the Iziko Museums of South Africa.

List of specimens to be sectioned:

I request permission for the following limb bones to be sampled:

Scylacops Sam-pk-10188 – tibia, femur, humerus

Gorgonopsian Sam-pk-k4460 – humerus

Gorgonopsian Sam-pk-k6407 – humerus, femur

Arctognathus Sam-pk-k6415 – tibia, ulna

Aelurognathus Sam-pk-k10000 – humerus, ulna, radius, tibia

Aelurognathus Sam-pk-k10035 – ulna, humerus

Gorgonops Sam-pk-k10110 - humerus