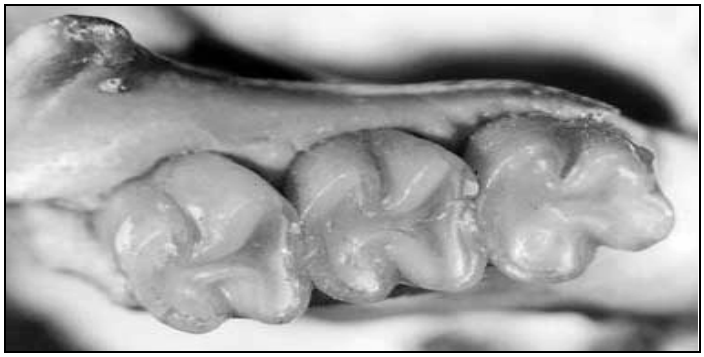
What fossil bones and teeth can tell

In order to try and work out how extinct animals lived and behaved, scientists study the fossilized bones and teeth they recover from archaeological and paleontological sites. Teeth are particularly useful as they are capped by enamel, an extremely strong and durable biological substance. There are a number of analyses, some of which are visual, and some chemical, which are commonly used in paleoenvironmental analysis. These are as follows:

Morphological studies

Morphology is the study of how fossil bones and/or teeth have changed in their size and shape over time. Changes in overall body shape and size, skeletal and dental anatomy and dental wear patterns can be used to deduce changes in diet, locomotion (the way the animal moves), positional and social behaviour (for example, a species may change its diet over time as a result of competition with another species which eats the same food), feeding and foraging strategies and preferred habitat.

Ecomorphology correlates changes in morphology with changes in the behaviour of the animal, and in the paleoenvironment in which an animal lived. Changes in the average body size of a species may be used to extrapolate changes in environment or climate. For example, dassies (rock hyraxes) have been found to show shifts in body size which are directly related to changes in rainfall.



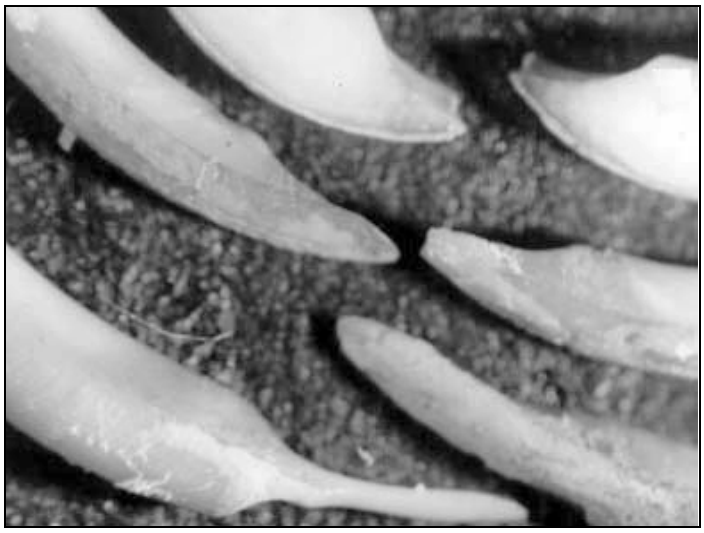
Molarsof the extinct mole rat Bathyergus Hendeyi, one of the most common rodent spieces found in the fossil deposits at Langebannweg.

Wear patterns on teeth

Micro-wear: Dental microwear is the study of the microscopic scratches and pits that form on a tooth's surface when an animal chews its food. Patterns of dental microwear on mammalian molar teeth reflect the material properties of food items eaten and provide a useful tool for investigating the diet of fossil animals. For example, heavily pitted molar surfaces generally suggest a diet consisting of harder,

more brittle food items such as hard seeds, nuts or bone. In contrast, a heavily scratched shearing facet on a molar tooth usually indicates that that tooth was used to shear tough food items such as leaves or meat. Intermediate patterns indicate mixed diets, or diets with intermediate food properties.

The dental microwear patterns of living animals which eat a specific type of diet are studied in order to understand the patterns observed in fossil animals and to reconstruct their eating habits. Micro-wear is most commonly used in the analysis of fossil assemblages to distinguish between grazing, browsing and mixed feeder animals as this provides information on the plants and environment in which the animal lived. Differences in diet between the same species over time may be linked to morphological changes in the jawbones, skull or teeth.



Mouse incisors photographed through a microscope. These teeth were extracted from a barn owl pellet and show varying degrees of digestion. The tooth on the bottom left has had all the enamel and much of the dentine removed by the digestive juices of the owl which ate it, and then regurgitated the prey bones and teeth in a pellet. The digestion patterns of many of the fossil rats and mice found at the Fossil Park indicate that they were originally deposited inside owl pellets.

Reconstructing diet through isotope studies

It is also possible to reconstruct the diet of extinct animals, which in turn provides information on the environment in which they lived, by studying the carbon isotope ratios of the teeth of fossil animals. This is expanded upon in 'You are what you eat'**.**

References:

Klein, R. G., and Cruz-Uribe, K. 1996. Size variation in the Rock Hyrax (Procavia capensis) and Late Quaternary climatic change in South Africa. Quaternary Research. 46:193-207.