

**Trace element chemistry of
melanosomes revealed by
synchrotron-X-ray fluorescence: a
tool for interpreting fossil vertebrate
soft tissue**

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Melanosomes are important components of integumentary tissues in modern vertebrates and have been reported from various vertebrate and invertebrate fossils ranging in age from the upper Palaeozoic to the Cenozoic. Much previous work on fossil melanin has focused on reconstructions of integumentary colour in fossils. Modern vertebrates, however, also possess melanin pigmentation in internal tissues. The impact of these internal melanosomes on interpretations of fossil soft tissues has not been assessed and, critically, there is no known mechanism to discriminate between melanosomes from different tissue sources. Here we present the first systematic analysis of the anatomical distribution, morphology and chemistry of melanosomes in different vertebrate taxa. Melanin extracts from various tissues from extant amphibians, reptiles, birds and mammals were analysed using scanning electron microscopy (SEM) and synchrotron X-ray fluorescence (XRF). Our results reveal striking differences in trace element chemistry both within individual animals and among taxa. These findings can be applied to fossils to allow integumentary and non-integumentary melanosomes to be discriminated, offering a new tool for the investigation of the preservation potential of soft tissues in the fossil record and more accurate interpretation of the internal anatomy in extinct animals.