

X-ray phase contrast examination of some characteristic tissues obtained from three different classes of vertebrates: birds, mammals and amphibians.

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Using microtomography based on x-ray phase contrast and absorption contrast at the SYRMEP beamline (Elettra, Trieste, Italy) we studied some structures and some tissues obtained from three different classes of vertebrates: amphibians, birds and mammals. For the birds, we focused our attention in particular on analysis of feathers using phase contrast. These singular structures, found only in dinosaurs and the birds, were evaluated to detect possible microscopic differences between species with different behaviour and anatomical characteristics. To do this, we collected wing feathers (remiges) and tail feathers (rectrices) from four European species: greater white-fronted goose (*Anser albifrons*), a long-distance migratory bird; barn owl (*Tyto alba*), a nocturnal bird of prey with modified feathers to reduce noise during hunting; great spotted woodpecker (*Dendrocopos major*), an arboreal bird specialized in feeding on insect larvae under the tree cortex, using its tail to support its body weight; and wood nuthatch (*Sitta europaea*), a small passerine with behaviour similar to the woodpecker, but with very different anatomical characteristics. Moreover we analyzed by x-ray phase contrast the microscopical differences between remiges obtained from one subject of free healthy swifts (*Apus apus*) and one young subject fed with an incorrect diet, and showing diseased feathers.

The preliminary examination for the mammals focused on the study of age determination using the cementum stratification inside the teeth in the european wild cat (*Felis silvestris silvestris*). To do this, we analyzed the incisor tooth obtained from some cats' skulls, using absorption contrast. The purpose of this preliminary study is to evaluate the age of these wild cats by a non-destructive method, in contrast to the widely accepted standard method used in carnivores, histology, in which the teeth are sectioned and so the samples are destroyed.

Finally we analyzed an endemic hypogeal amphibian of the Balkan karst area (Carso), the olm or proteus (*Proteus anguinus*), using the Tomolab facility, a laboratory based x-ray microtomography facility. This rare animal was examined for the first time by x-ray tomography, highlighting the particular skeleton structure of its body.

Image analysis, three dimensional reconstruction and phase retrieval for this work was carried out by Sara Mohammadi, and work is continuing.