

Squamata (i.e. lizards and snakes) are principal components of most terrestrial and aquatic environments across the planet. Their huge taxonomic diversity, counting more than 10,000 extant species, comprises, among others, iconic and emblematic species, as well as many medicinally important taxa. Frustratingly, most of these species are at the edge of extinction, due to rapid environmental and habitat destruction and other human-mediated causes. Nevertheless, many aspects regarding their evolution and taxonomic diversity across the Cenozoic Era (65 million years ago to today) remain a mystery. Europe and the Mediterranean portions of Africa and Asia nowadays house a relatively modest diversity of squamates, especially when compared to the immense species richness and morphological disparity of these reptiles currently observed in the tropics. Nevertheless, fossil record attests that Cenozoic lizards and snakes of Europe and adjacent areas achieved an extremely wide variety of morphotypes, shapes, sizes, ecological adaptations, and locomotion styles, and pertained to a large number of lineages, many of which are now extirpated from the area or even totally extinct. However, the precise phylogenetic affinities of many extinct squamate groups remain obscure, while for Eastern Europe, and the Mediterranean portions of Africa and Asia, data from squamate fossil remains are rather scarce. Moreover, there is no consensus as for the biogeography and dispersal events of most lineages, as well as for the extinction patterns that affected their past diversity in the region. With this project, I aim to thoroughly investigate major questions about the evolution of squamates in the Cenozoic of Europe and the circum-Mediterranean, particularly regarding their diversity, evolutionary patterns, anatomy, biogeography, and extinction events that can be gleaned through their fossil record. To do this, I plan to describe a large number of new specimens of lizards and snakes originating from several different fossil localities, pertaining to a wide array of ages and geographic areas (the Paleocene of Morocco, the Eocene of Tunisia, France, Switzerland, England, and Germany, the Oligocene of France and Turkey, the Miocene of Poland, Switzerland, Greece, Turkey, and France, and the Pliocene and Pleistocene of Greece, Turkey, and Poland). Several of these specimens, particularly from the Eocene of Germany, represent complete skeletons from the world renowned Fossilagerstätte localities of Messel and Geiseltal, while disarticulated, but well preserved, specimens are remarkably abundant in the remaining localities, including from areas that have been so far poorly sampled for squamates, such as Eastern Europe, Anatolia, and northern Africa. From a preliminary view I made on this material, I realize that many of these specimens possess distinct morphologies and features that would allow the establishment of new taxa and/or documenting novel anatomical features or ecological adaptations, while others belong to groups that have not been previously known from the respective broader geographic area or age. I aim to study the complete skeletons from the Fossilagerstätte localities with the aid of microcomputed tomography (m-CT) scanning and 3D imaging, which will reveal anatomical features that would be otherwise non-visible. For the vast majority of the disarticulated specimens, they will be mainly investigated through visual microscopy, however, for many of these, m-CT scanning will also be performed in order to reveal important aspects on the microanatomy, histology, physiology, and further diagnostic features. Accordingly, all these specimens will be the main focus of several different papers focusing on the anatomy, taxonomy, and phylogenetic affinities of particular species or groups of squamates. Most importantly though, these new finds, coupled with detailed databases with all known fossil occurrences of squamates that I have been compiling, will enable me to conduct analytical approaches to study evolutionary patterns of the Cenozoic lizard and snake communities of Europe and the circum-Mediterranean. As such, I will investigate patterns of diversification and biogeography, when modern taxa appeared in the area, and test how each one of the squamate lineages responded to each of the major faunal dispersal and extinction events that hampered the Cenozoic of the region.