Annelida (segmented worms) is a diverse and widely distributed group of invertebrates. Earthworms are one of the best recognized and important, from e.g. ecological point of view, groups of annelids. Everybody knows pink earthworms slowly crawling on the ground after rain. From the biological point of view earthworms are primarily terrestrial and burrowing annelids which possess a clitellum. The clitellum (saddle) of all earthworms is in fact a specialized multilayered epithelium characteristic for specific segments which produces and secrets a large number of proteins into a cocoon. These proteinaceous reserves replace yolk in embryo feeding. However earthworms are animals with a very well-known morphology, anatomy and physiology (the anatomy of the earthworm Lumbricus terrestris is in almost each textbook of zoology) it seems very surprising that the data about the ovary structure and the course of oogenesis in earthworms are very limited and not complex. On the other hand both in earthworms and other clitellate annelids (i.e. in annelids bearing clitellum as potworms or whiteworms) the localization and morphology of gonads, and more widely reproductive systems are very important for their identification and classification. Taking into account these two facts **the main goal of the project is to carry out comparative microscopic analysis of the ovary organization and the course of gamete production (oogenesis) in the selected earthworm taxa, and what is more, to use these histological and ultrastructural data to elucidate the ovary evolution and together with molecular data to create combined "morpho-molecular" phylogenetic tree of earthworms.** Such combined phylogenetic analysis with the use of new data connected with ovary histology and ultrastructure together with molecular data gained in the project (five genes are planned to be sequenced in the each studied specimen) should shed more light on both the developmental biology and evolution of earthworms.

To achieve the intended effects three sets of methods will be used. Light (including fluorescence) microscopy and electron microscopy techniques will be used to fully analyze the cellular composition (histology) and ultrastructural details of cells which constitute ovaries and the functioning of ovaries in six families of earthworms and two groups of their closest relatives. Molecular methods will allow to isolate DNA and partially sequence the selected genes (12S, 28S, 18S, COI, and histone H3) for each analyzed specimen. Then, the methodology specific for phylogenetic analysis like maximum likelihood and maximum parsimony approaches will be employed to estimate the phylogenetic relationships among the studied taxa based on genes sequences and histo-ultrastructural traits. Such wild range of methods will give the new data about not only ovary composition and functioning but also about ovary evolution. Moreover, the results obtained allow to verify the older and contemporary scenarios of earthworm phylogeny.