In the history of the biosphere, the Middle Paleozoic time interval, between 445 and 372 million years ago, is distinguished by rich and diverse assemblages of organisms with calcareous skeletons, inhabiting vast, shallow and warm seas, often constructing reef build-ups. The paleontological studies to date have, to a relatively small extent, included microfossils, which were examined almost exclusively in cross-sections in thin plates. Among them abundant, often rock-forming, there are many groups of unknown biological position - usually it is not known whether they are fossilized either unicellular or multicellular organisms, plants (algae) or animals, benthos or plankton. Answering these questions is the main goal of this comprehensive, pioneer research, focused on isolated microfossil specimens. With the help of an multidisciplinary set of modern microscopic, electron and geochemical methods, it will be possible not only to learn about the general architecture and hierarchical structure of calcified parts of ancient microorganisms, even at the level of a millionth of a millimeter (so-called nanostructures). This will allow unambiguous differentiation of unchanged (original) skeletal parts from those that were postmortem due to the processes of decomposition of soft parts or have undergone changes during fossilization of microfossils during millions of years of geological history. Thus, it will make it possible to reliably learn the similarities and differences in relation to groups of microorganisms known from younger geological eras and those living today, and thus will form the basis for the correct interpretation of their evolutionary history.

The best example is the today's group of protozoa with various calcareous shells - foraminifers, which at that time was in a poorly understood initial stage of evolutionary development. It is already known that in this case the secondary (recrystallized) structures of their shells were usually considered as primary ones. It is not excluded that groups of new organisms will be discovered among groups of unrecognized biological position, as well as the mode of their life, shell growth patterns and the formation of other their biomineral structures, as well as their secondary modifications.

In the environmental context, these microorganisms will be studied as a key element of the lowest levels of the food pyramid of complex shelf ecosystems, different in lagoon, reef and open sea environments, as well as the subject to various fossilization processes. In the current ecological interpretations, high fertility levels (eutrophication), hypoxia and excess (or deficiency) of calcium ion are considered as key factors controlling the development and conditions of fossilization of these shelf microbiocenoses. Comprehensive research, above all geochemical methods, should allow to specify the scope and form of these physico-chemical environmental conditions.