The quality of life in modern society, as well as further advancement of our civilization, strongly depends on the progress achieved in synthetic organic chemistry. Our ability to synthesize complex substances of desired biological or physicochemical properties has improved dramatically over the past few decades. This progress is inherently associated with development of new efficient and environmentally friendly methods of preparing particular classes of organic compounds.

The fundamental feature of the structure of all organic substances is their carbon skeleton, that is a set of carbon atoms directly bound one to another with chemical bonds. Therefore, carbon-carbon (C–C) bond-forming reactions are the central theme of organic chemistry. Particularly useful and important are those reactions which enable formation of C–C bonds directly from carbon-hydrogen (C–H) bonds, without the need of substituting hydrogens with other, auxiliary functional groups containing heteroatoms. Such approach to organic synthesis, relying upon C–H bond activation in one, or better in both interacting substrates, allows preparation of the desired complex target products more efficiently, using simpler and more available starting materials and transforming them in fewer synthetic steps. That, in turn, means reduced consumption of resources (reagents, solvents, time, energy) and diminished production of waste products which are often dangerous to the natural environment. In recent years, a huge research effort has been devoted to the development of the C–H activation processes catalyzed by small amounts of transition metal complexes, mainly palladium, rhodium, copper and others.

Nitrones are nitrogen-containing derivatives of carbonyl compounds (aldehydes and ketones). Owing to their peculiar and rich chemical activity, nitrones found very wide applications as synthetic intermediates in the synthesis of complex and useful nitrogen organic products, such as unnatural aminoacids, biologically active alkaloids, amines, pharmaceuticals, ligands, compounds exhibiting interesting physicochemical properties, etc. Within the project, practically unknown reactions of Pd and Cu-catalyzed C–H activation processes of nitrones will be discovered and investigated. The new reactions will involve selective transformation of the nitrone C–H bond into a C–C bond, that is a transformation of simpler nitrones derived from aldehydes into more complex ones, formally originating from ketones. Moreover, tandem reactions will be attempted, that is one-pot processes in which the initial C–H activation reaction introduces a substituent containing a functional group capable of reacting with the nitrone function, leading to further increase of molecular complexity.