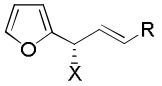
The main goal of this project is development of new methods for the enantioselective synthesis of furyl alcohols and amines having general structure presented at the picture below:



X=O, $HNSO_2Ar$
R=H, $CH_2OSi(CH_3)_2{}^tC_4H_9$, $CH_2OC(C_6H_5)_3$, etc

because so far does not exist general methodology allowing for the enantioselective synthesis of such alcohols and *N*-sulfonylated amines; the methods for the synthesis of compounds bearing hydroxy groups as substituents at termini of the double bond are of special value due to more efficient functionalization of the double bond and possible chain elongation.

These compounds will be subjected to the reaction known as Achmatowicz rearrangement, the reaction developed by Polish chemist Osman Achmatowicz Jr. As a result, *O*- and *N*-heterocycles

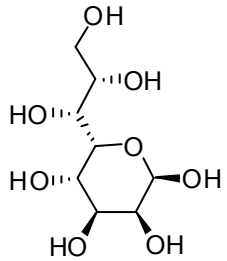
X=OH, $NHSO_2Ar$

are obtained. Transformation of this heterocycles leads to valuable compounds with high biological activity.

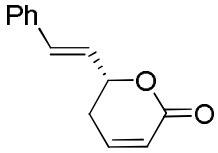
We will develop methods for the synthesis of the above described α, β-unsaturated furyl alcohols and amines by the alkenylation reactions using organozinc reagents [R=$CH_2OSi(CH_3)_2{}^tC_4H_9$, $CH_2OC(C_6H_5)_3$] or by iridium-catalyzed asymmetric allylic substitution (R=H).

Next, we will subject thus obtained substrate to both Achmatowicz (X=O) and aza-Achmatowicz (X=$HNSO_2Ar$) rearrangements.

Thus obtained compounds can be converted into many natural and biologically active compounds. We plan to prove the effectiveness of our approach by synthesis of higher monosaccharides eg.



and (-)-goniothalamin, natural compound having promising cytotoxicity against various cancer cells



The methodology for alkenylation developed during realization of this project can be extended for use with other aldehydes and imines, both aliphatic and aromatic.