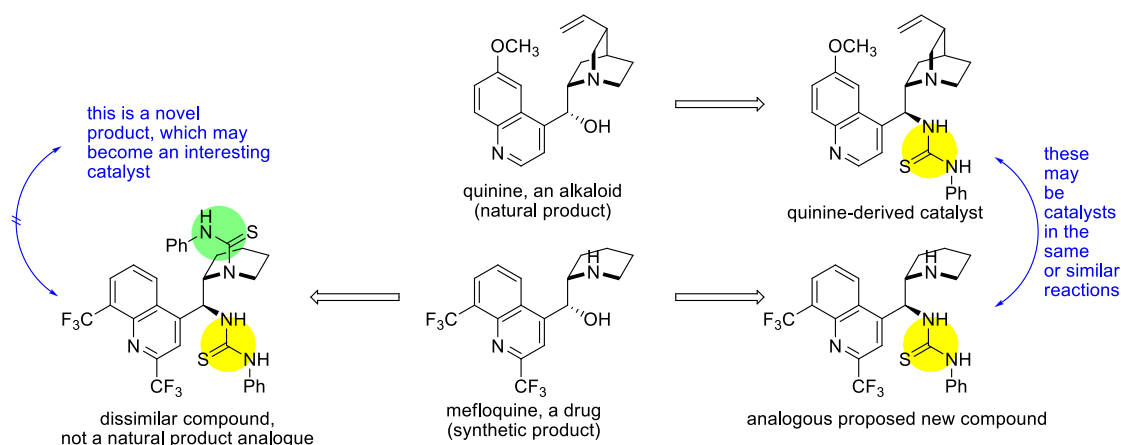


The art of converting one molecule into another is the essence of chemistry. This way from various raw materials we obtain highly complicated chemical compounds that can serve various roles in our lives and in industry. Ability of the planet to feed many more people than previously expected is attributed, among other things to the development of crop-protection chemistry (biocides). The fact that medicine can fight numerous disorders is also a result of development of synthetically made drugs. The sophisticated nature of these two groups of compounds has made them as well as other novel chemicals ever more difficult to obtain in an efficient manner. This challenge is being tackled by a branch of science called catalysis. In principle, chemists apply a small quantity of a special chemical called catalyst to accelerate the formation of a desired molecule from raw starting materials and reduce the quantity of waste byproducts. A particular case of catalysis is when we want to make a distinction between a product molecule and its mirror image. While such a difference may seem unnoticeable at a first glance it may change a drug to a poison. To make a catalytic transformation that would form a safe desired product, we would also need a catalyst that is in itself asymmetric that is different from its mirror image.

Chemists have produced many asymmetric catalysts by transforming sour (tartaric acid), sweet (proline), and bitter (*Cinchona* alkaloids) compounds obtained from plants. However, the problem with asymmetric catalysts is that a single catalyst can only be used effectively in a limited number of transformations. Therefore, there is an ongoing drive for new and more efficient catalysts for various purposes. On the other hand number of different molecules that are cheaply available from nature is limited. Furthermore, some of the desired parts of a catalyst cannot be put together easily when a catalyst is made from a particular natural product. In this proposal we want consider some of the products of pharmaceutical industry to be transformed into novel asymmetric catalysts. This approach makes use of similarity between some medicines and asymmetric catalysts. On the other hand differences make it facile to incorporate certain parts into their structure, which were not previously feasible.



Within this proposal we will use and make new synthetic compounds that resemble natural plant alkaloids. This type of an approach gives ability to freely modify these molecules at almost any site. We will investigate various ways of their conversion into an array of potential catalysts and test their efficiency. This way we will expand current knowledge and introduce overlooked scaffolds to catalytic applications. Hopefully the project will conclude with scientific solution that will find future practical utility.