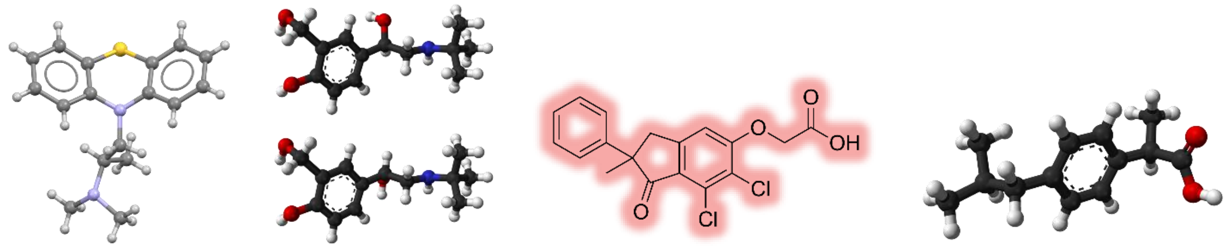
Since Louis Pasteur's discovery of chirality in the mid-19th century, research on compounds of this type has consistently enjoyed immense popularity among scientists worldwide. This is, of course, closely linked to the fact that a vast number of biomolecules contain chiral centers, making the study of these systems integral to understanding various processes occurring in animal and human organisms.

Over the decades, numerous types of chirality have been described, including point chirality, axial chirality, planar chirality, and helicity. Compounds containing chiral fragments are utilized in various fields, with particular emphasis on pharmaceuticals. A significant number of drugs are chiral compounds, and examples of some of them are shown in Figure 1 below.



Promethazine Salbutamol Indacrinone Ibuprofen

Figure 1. Drug molecules containing chiral centers.

Syntheses of chiral compounds is not a trivial task. Often, natural compounds derived from various biological sources are used as substrates, as nature has developed numerous methods for synthesizing them in plants and animals. However, scientists have also devised strategies to produce chiral compounds in laboratories. One such approach involves the use of chiral catalysts, i.e., metal complexes that feature chiral fragments in their structure. This project aims to synthesize such systems using helically chiral molecules known as [n]helicenes. An example of such a catalyst is shown on the left side of Figure 2. Using this catalyst, we aim to synthesize additional chiral compounds with axial chirality that include alkynyl elements in their structure (see the right side of Figure 2).

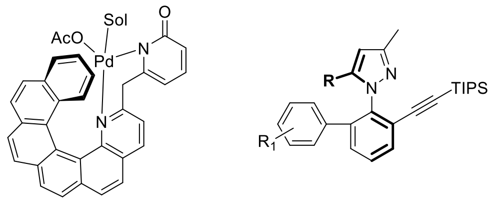


Figure 2. A chiral palladium catalyst (left side) and an example of a chiral product (right side).

The scientific work planned within the project also aims to synthesize compounds combining the properties of helical and polyyne fragments, thereby achieving several objectives. One of these is the development of polymers based on helicene-1-haloacetylene systems. An example of such a polymer is shown in Figure 3 below. The resulting polymer is expected to feature a uniquely twisted polyene chain, imparting specific physicochemical properties, which will be thoroughly characterized during the study. One anticipated property is semiconductivity, which could find applications in nanoelectronic systems.

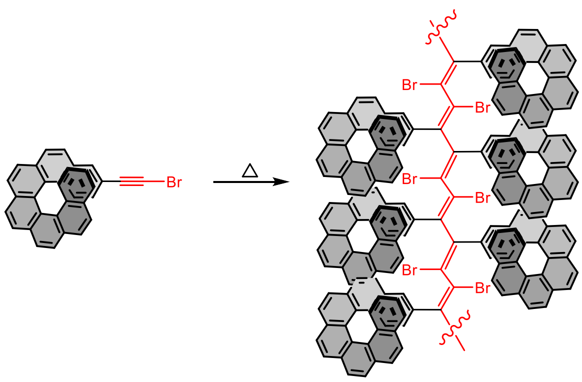


Figure 3. Poly(bromoacetylene) with chiral side groups.