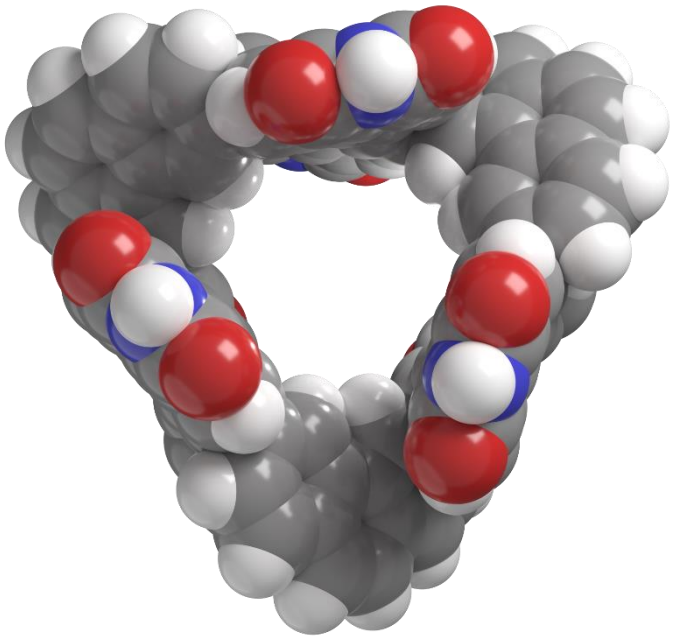
Molecules of aromatic compounds, such as benzene or naphthalene, typically contain flat rings of atoms. This flat arrangement provides the most comfortable living space for the so-called π cloud, made up of the fastest-moving electrons in an aromatic molecule. Interesting things can happen when you build an aromatic molecule that is not flat, either because it contains several linked aromatic fragments that are not in one plane or because the molecule is bent. Such 3D aromatic molecules change their ability to absorb and emit light. They also differ from their flat relatives in the way they interact with electrons. Some of those 3D molecules feature large cavities, as shown in the picture below, which can be used for sensing or storage of other, smaller molecules.



In this project, we will design and make new aromatic molecules with a variety of shapes and sizes, looking for unusual and useful properties, such as strong absorption and emission of light. Our molecules will be able to easily accept electrons, a feature useful in designing new material for batteries. The addition of electrons (known in chemistry as “reduction”) will affect their ability of our compounds to absorb light. The reduction may result in a simple color change, but it may also lead to absorption of invisible infrared radiation. Some of our molecules will be chiral, that is, they will exist in left- and right-handed versions, similarly to a pair of hands. 3D chiral aromatic molecules may be especially useful for generation of polarized light in a process known as circularly polarized luminescence.