Chiral Dyes as Photoredox Catalyst for *Visible Light* Induced Enantioselective Transformations

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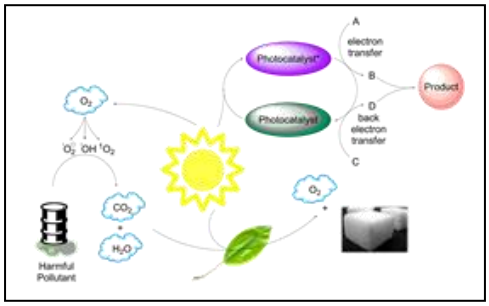
In a world filled with waste, pollution and limited resources, most of which was primarily generated by us "the humans", we seek a renewable source of energy. For millennia the sun has been revered and worshipped, but in the modern age, as the earth suffers around us, our egos have been beaten by the mistakes of the past and once again we look to the sun for inspiration. The sun brings light to the darkness, once embraced; applications are boundless requiring only an idea, a pen and paper.

As chemists we try to make the impossible possible, pushing towards greener chemistry, creating unnatural compounds in the most environmentally friendly way possible. Hence, light can be a very good ally to the chemist, especially in photo-chemical reactions. Unfortunately, exposing a chemical reaction to light normally will not magically generate the desired product. The addition of a catalyst is required, this works by metaphorically adding a little spark to the reaction to get things moving. Moreover, certain catalysts remain dormant in the dark, waiting for that all important light, which turns the catalyst on like a flick of a switch and getting the reaction started.



For a lot of reactions this is usually enough, however as you move into more complex compounds such as natural ones an important feature arises; stereochemistry. In some cases if the stereochemistry is wrong or opposite in the final compound it cannot function as intended and can have adverse effects. In nature this is not an issue as Mother Nature is the ultimate chemist, creating perfect compounds from almost nothing. Trying to imitate nature is a challenge dating back to the beginning of time, nowadays modern chemistry usually employs another molecule, a chiral scaffold that helps to control configuration of the final compound.

Therefore if one would be interested in conducting a light induced reaction in a stereospecific manner a cocktail of ingredients must be added to give the desired effect. **It is the goal of our project to create a single molecule that blends all these attributes together to achieve the overall goal of stereospecifically catalyzing a reaction by light.** Although the premiums of the project if simply outlined, the reality is quite different. In order to achieve this goal a catalogue of organic dyes, known and unknown must be tested in specified organic reactions and then chiral scaffolds will be introduced into the structure of these dyes that will dictate the stereochemistry. Even though in all chemistry luck plays an important role, to understand and build on the knowledge one must learn from each modification, each dye, each catalytic reaction to not only create the ultimate catalyst for our reactions, but to expand the area of photo-catalysis. Some might say this is difficult, but we would say exciting.