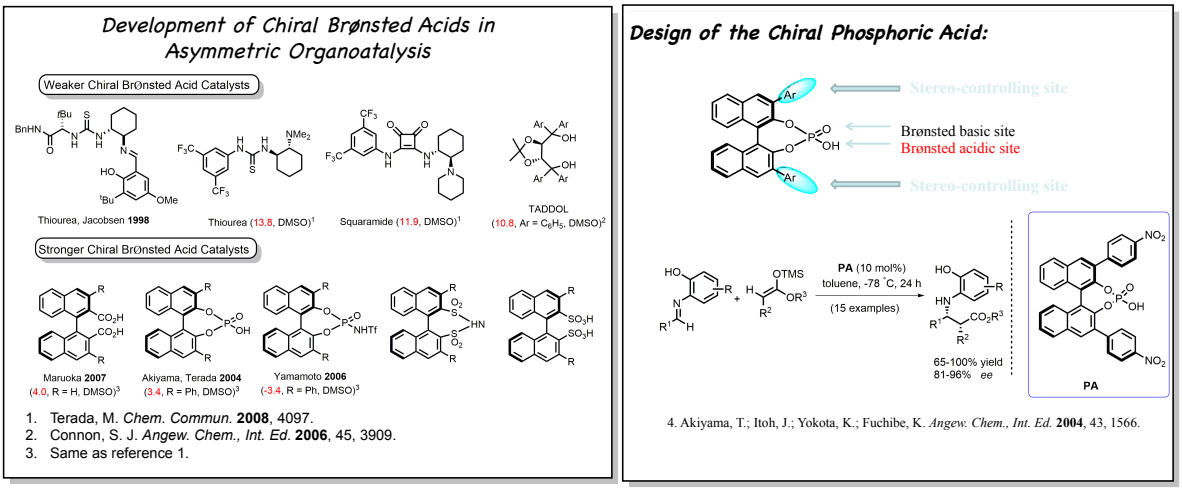
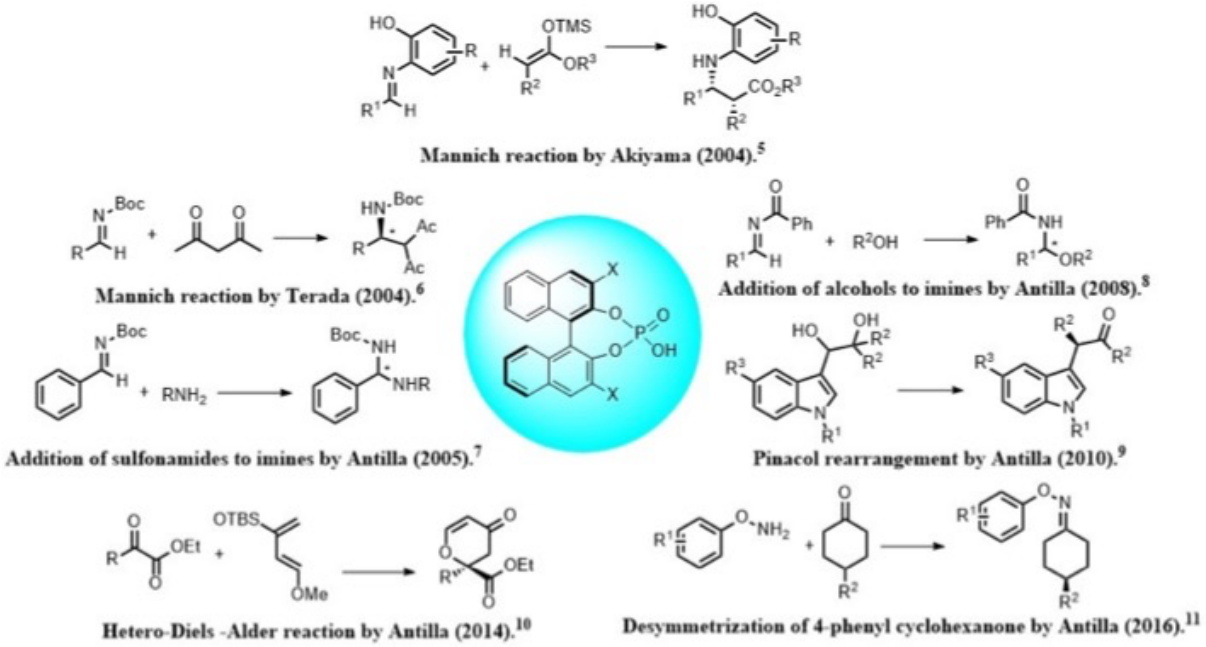
Antilla Group Research: Past Accomplishments

Stereochemical control is central to the synthesis of most new biologically active pharmaceuticals and natural products. With over 80% of new pharmaceuticals and over 90% of biomolecules being chiral, the development of new methodology that exhibits high stereocontrol is essential for drug design and synthesis. *Chiral phosphoric acids (CPA's), small-molecule organic compounds, have been shown to be excellent organocatalysts (organocatalysts – note the Nobel Prize for Chemistry was awarded in this area in 2021), and we were one of the pioneering groups using CPA's. Additionally, the use of Chiral Metal Phosphate complexes as enantioselective catalysts represent an important, and often still emerging area where stereocontrolled methods are still discovered.*



Despite the early success of chiral Brønsted acid catalysis (CPA's and others), there is room for additional methods development, and that also includes chiral metal phosphates as catalysts. If researchers can discover new types of chemistry using these catalysts it would obviate the need for new methods development and the demonstration of reaction utility. Our research group has been one of the world leaders in this field of study, with over 70 papers in the last 10+ years in this area (see CV).

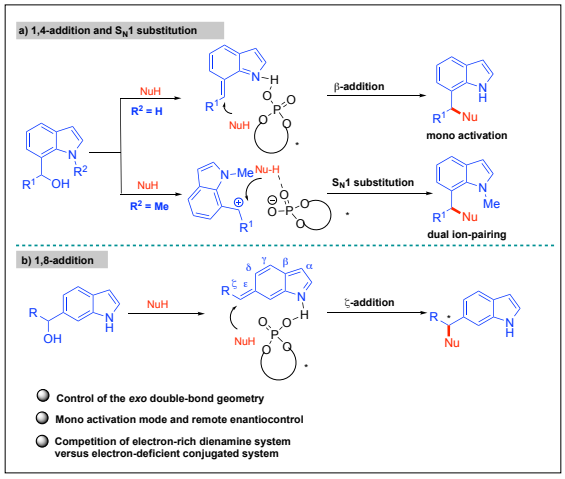
Antilla Group Key Publications before 2018



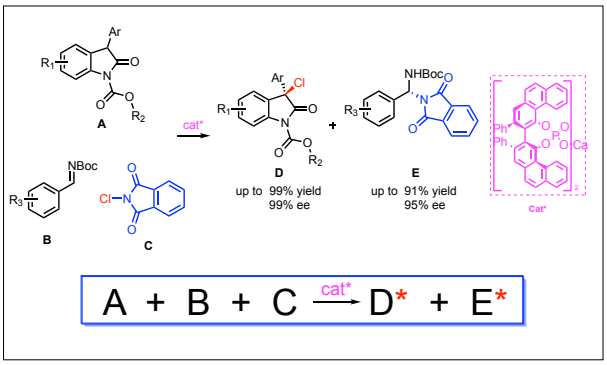
Antilla Group Research: Recent Work and Future Directions at LSUS

Our research group has continued our focus on the use of chiral phosphoric acids and their respective chiral phosphate metal complexes to catalyze a wide variety of stereochemically controlled reactions. Already great success is being achieved, with several high impact papers appearing in the literature since my research started in China. Here is a summary of just a few of the projects from my established group (for a full list, see CV):

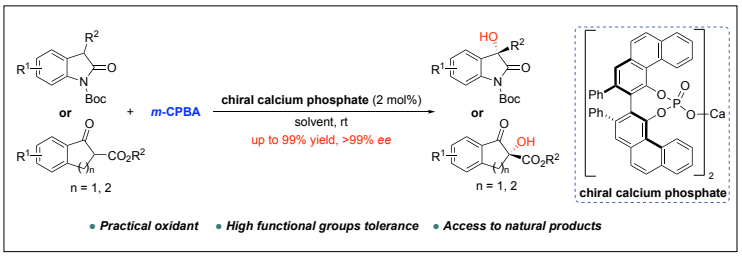
"Chiral Phosphoric Acid-Catalyzed Asymmetric Synthesis of Hetero-triarylmethanes from Racemic Indolyl Alcohols," Yu, C.; Na, F.; Fang, X.; Cao, Y.; Antilla, J. C., *Angew. Chem. Int. Ed.* **2018**, *76*, 11004.



"Catalytic One-Pot Double Asymmetric Cascade Reaction: Synthesis of Chlorinated Oxindoles and Geminal Diamines," Fang, X.; Deng, Z.; Zheng, W.; Antilla, J. C., *ACS Catal.* **2019**, *9*, 1748.



"Asymmetric Rubottom-Type Oxidation Catalyzed by Chiral Calcium Phosphates," He, H..; Tummalapalli, K. S. S.; Zhu, L.; Chen, M.; Krishnamurthy, S.; Antilla, J. C., *Chem. Eur. J.* **2023**, *29*, e202300232.



Future Research:

<u>The development of new catalytic reaction methods utilizing naturally abundant metals for sustainable, green chemistry</u>.

Our studies in the future will resemble on our existing strengths of the past, but with more of a focus for the chemistry to be toward ***<u>sustainable</u>*** reaction methods. These more environmentally friendly methods will be geared toward the use of non-toxic and abundant metal-based catalytic asymmetric methods. Alternately, the use of ***<u>organocatalysts</u>*** like chiral phosphoric acids fall into these sustainable catalytic methods as well, so we will also continue to use these catalysts. We will use copper, iron, and alkali earth metals (mainly Ca and Mg) for most of our catalysis. We have published extensively in these areas (see CV). We have several projects that have preliminary results that undergraduates could continue to explore with my guidance. Some of the projects are earth abundant metal-based catalysis (Cu for example) and could represent new directions for catalysis of this type.

I have worked extensively with undergraduates in the past. Undergraduates have published in my laboratories and have moved on to graduate with distinction (Juan Baso won University of South Florida's first Goldwater Fellowship and Corey Garvin, of Native American decent, was funded by an American Chemical Society grant), others went on to

pharmaceutical companies (Lucas Hernandez, a senior scientist at BMS, and many others in big pharma) or sales (Matt Kaplan), others to graduate school and academic jobs (Jeremy Baskin is a Professor at Cornell), and still others that worked for me went on to government jobs (Shawn Larson has worked for the DEA and FDA). **I believe my projects in sustainable chemistry will match well with the potential job market.**