

THEORY-LED DESIGN OF NEW LIGANDS FOR ASYMMETRIC CATALYSIS

Authors, Robert S Paton,* Ruchuta Ardkhean, David M. H. Ascough, Alex V. Brethome,

Chemistry Research Laboratory, 12 Mansfield Road, Oxford OX1 3TA, UK; Department of Chemistry, Colorado State University, Fort Collins 80523, USA

e-mail: robert.paton@colostate.edu

Despite the widespread adoption of computational tools across chemistry, the design of asymmetric catalytic reactions is not yet routine. In this talk I discuss some of the inherent challenges involved in the quantitative prediction of stereoselectivities, and our ongoing approaches to overcome them.^[1] We present approaches for the design of new phosphoramidite ligands for asymmetric transition metal catalysis. Alternative approaches, based on a full mechanistic study of competing pathways^[2] or on the development of quantitative structure-enantioselectivity relationships will be compared.^[3]

- 1) (a) Johnston, C. P.; Kothari, A.; Sergeieva, T.; Okovytyy, S. I.; Jackson, K. E.; Paton, R. S.; Smith, M. D. *Nature Chem.* **2015**, *7*, 171; (b) Duarte, F.; Paton, R. S. *J. Am. Chem. Soc.* **2017**, *139*, 8886 (see also *JACS* spotlight **2017**, *139*, 8383).
- 2) (a) Straker, R.; Peng, Q.; Mekareeya, A.; Paton, R. S.; Anderson, E. A. *Nat. Commun.* **2016**, *7*, 10109; (b) Pupo, G.; Ibba, F.; Ascough, D. M. H.; Vicini, A. C.; Ricci, P.; Christensen, K.; Morphy, J. R.; Brown, J. M.; Paton, R. S.; Gouverneur, V. **2017**, *in review*.
- 3) (a) Ardkhean, R.; Roth, P. M. C.; Maksymowicz, R. M.; Curran, A.; Peng, Q.; Paton, R. S.; Fletcher, S. P. *ACS Catal.* **2017**, *7*, 6729; (b) Ardkhean, R.; Mortimore, M.; Paton, R.S.; Fletcher, S. P. *Chem. Sci.* **2018**, 10.1039/C7SC05304E