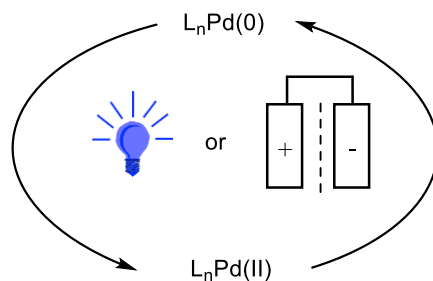


# ALTERNATIVE ENERGY DRIVERS IN METAL CATALYZED COUPLING REACTIONS

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The ability of transition metal catalysts to mediate new bond forming reactions has had a dramatic impact on modern molecular synthesis. Nevertheless, a central feature in these reactions is need to balance of reverse operations on the catalyst so it is regenerated at the end of each cycle of product formation, which can limit catalytic activity and the scope of many transformations. This talk will describe our efforts to address these challenges by introducing alternative, often renewable, energy sources into catalysis, and from this create new bond forming reactions. These include using visible light excitation directly on active palladium catalysts to drive the oxidative addition/reductive elimination cycle in coupling reactions independent of the classical limits in thermal catalysis, or the use of electrochemistry to change the nature of the metal throughout the cycle.<sup>[1]</sup> Combining these with the favored energetics of carbon monoxide conversion to carboxylic acid derivatives can be used to drive the build-up of reactive products from stable reagents. The use of this chemistry to create ambient temperature and general catalysts for carbonylation reactions, multicomponent transformations, acyl halide or even super-electrophile formation, or new avenues to C-H bond functionalization, will be discussed, as will the mechanistic origins of these influences, and their ability to enable the use of earth abundant catalysts in traditionally precious metal catalyzed reactions.



- [1] Martin Torres, G; Liu, Y; Arndtsen, B. A. *Science* **2020**, 368, 381; Liu, Y.; Zhou, C.; Jiang, M.; Arndtsen, B. A. *J. Am. Chem. Soc.* **2022**, 144, 9413. Kinney, R.G.; Tjutrins, J. Liu, N. J.; Arndtsen, B. A. *Nature Chemistry* **2018**, 10, 193; El Chami, K.; Liu, Y.; Belahouane, A; Lagueux-Tremblay, P. L.; Arndtsen, B. A. *Angew. Chem. Int. Ed.* **2023**, e202213297.