

# Richard F. Heck Lectureship

101 Brown Laboratory

October 14, 4PM

## *Invention of Metal-Catalyzed Synthetic Reactions*

Modern organic synthesis heavily depends on the fruitful potential of organometallic chemistry. This lecture will start with invention of *Nozaki-Hiyama-Kishi reaction*, which uses Cr(II) chlorides (in the presence of Ni halide for alkenyl iodide) to reduce C-halogen bonds. The invention and development of silicon-based cross coupling reaction (Hiyama Coupling), disclosed for the first time using trimethylvinylsilane with aryl iodides in the presence of Pd(II) catalyst and TASE,  $(Et_2N)_3S+F_2SiMe_3^-$ , in HMPA, will next be discussed.

What is the next target after the cross-coupling chemistry? An answer to this question, we consider, should be direct use of otherwise stable C-C or C-H bonds for making new C-C bonds. An approach is C-CN bond activation, leading to *carbocyanation reaction*, for which a combination of *nickel(0)/phosphine and Lewis acid* is extremely effective and a variety of nitriles are applicable to the reaction with internal alkynes. An alternative involves *C-H bond activation* followed by C-C bond formation, a contemporary topic in organic synthesis.

In summary, various combinations of catalyst systems are found to have potency for invention of unknown synthetic transformations. We believe *novel reaction* only produces *novel structure*, which definitely exhibits *novel function* that should be useful in the future synthetic technology. In this way, organic synthesis will continue to contribute to the progress in the medicinal and material science.



**Tamejiro Hiyama, Ph.D**  
**RDI Fellow, Chuo University;**  
**Professor Emeritus,**  
**Kyoto University**

Wine & Cheese Reception after the  
lecture in 201 LDL:

Industry representatives and faculty are  
invited to the first event of the Delaware  
Organic Chemistry Association (DOCA).



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