This thesis research aimed at development of new base metal-catalyzed transformations involving through-space C–H activation/metal migration. In particular, the present research was focused on transition metal-catalyzed reactions between arylmetal reagents and alkynes. Chapter 2 describes a cascade arylative cyclization reaction between ester- or ketone-tethered alkynes and arylzinc reagents that involves 1,4-cobalt migration as a key step. The reaction was achieved by a cobalt catalyst bearing an appropriately chosen biaryl-diphosphine ligand, which displayed unique reactivity in comparison with previously reported rhodium and iridium catalysts. Chapter 3 reports on the discovery of 1,4-chromium migration. Investigation into a chromium-catalyzed alkyne arylmagnesiation reaction unexpectedly indicated the feasibility of 1,4-chromium migration and allowed us to establish effective chromium catalyst systems for “migratory” arylmagnesiation of alkynes to afford ortho-alkenylaryl Grignard reagent. Stimulated by this discovery, we further developed a chromium-catalyzed [4+2] benzannulation reaction between 2-biaryl Grignard reagents and internal alkynes to afford phenanthrene derivatives, which is described in Chapter 4.

**DATE:** 10 November 2017

**TIME:** 10.00 AM

**VENUE:** Conference Room, SPMS Level 2

**SUPERVISOR:** Assoc Prof Naohiko Yoshikai