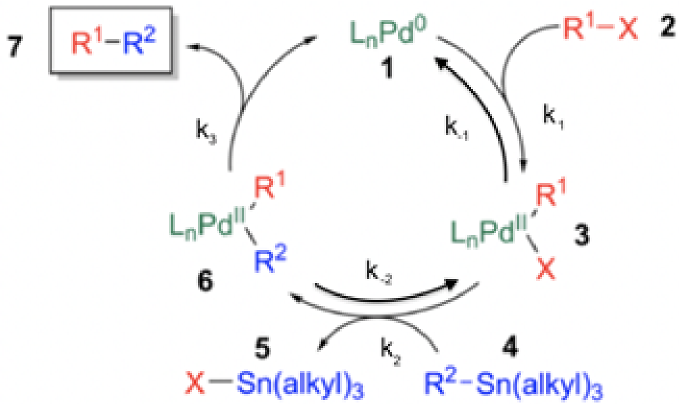
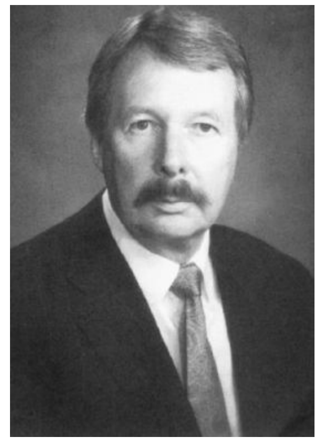
| *6.1* | *6.2* | *6.3* | *6.4* | *6.5* | *Total* |
|---|---|---|---|---|---|
| 3 | 1 | 1 | 17 | 4 | 26 |

***Still Time for Stille Coupling*** *(CODS-CT Team Round pt. 1 #6)*

*"oh Heck"*
*-Anugrah C.*



Depicted above is the mechanism for the Stille coupling, which has the general form:

$$R^1Sn(alkyl)_3 + R^2X \rightarrow R^1\text{-}R^2$$

Discovered in 1976 by Colin Eaborn and perfected by John K. Stille in the 1980s, the Stille coupling was one of the first palladium catalyzed cross couplings to be discovered, and has seen much use in total synthesis. The kinetics of this reaction can be studied by applying the steady state approximation to the mechanism. The steady state approximation assumes that the intermediate concentration in a multi-step reaction is constant. In this case we consider species **3** and **6** as intermediates, so we assume that d[**3**]/dt = 0 and d[**6**]/dt = 0.

***6.1*** Apply the steady state approximation to species **3** and **6**.

After some time upon mixing the reagents **1**, **2**, and **4**, the reaction reaches its steady state phase. At this point the concentration of species **1** is no longer equal to its original concentration but can be expressed in terms of [**3**], [**6**], and the initial total concentration of Pd: *c*(Pd).

***6.2*** Write an equation for [**1**] in terms of [**3**], [**6**], and *c*(Pd).
***6.3*** Write the rate equation for the formation of **7** in terms of [**6**].
***6.4*** Using the equations you have derived, rewrite d[**7**]/dt in terms of only *c*(Pd), any of the non-palladium reactants or products ([**2**], [**4**], [**5**], [**7**]), and rate constants.
***6.5*** Propose a synthesis of biphenyl $(C_6H_5)_2$ from benzene. You should use the Stille coupling.

*Proposed by Anugrah C.*