**Phosphine Ligand Challenge:** Since Wilkinson's pioneering use of PPh₃ as a ligand for rhodium-catalyzed hydrogenation and hydroformation in the 1960s, phosphine ligands have emerged as an indispensable tool in homogeneous catalysis. Several classes of "privileged" phosphine ligands have been discovered, including those shown below, that enhance reactivity and selectivity across multiple categorically distinct reaction classes.

Working in teams, for each of the ligands below: (1) propose a concise forward synthesis from simple starting materials, (2) provide the name of the ligand (or ligand family), (3) give the name of its inventor(s), and (4) for extra credit, discuss one category of reactions for which the ligand has been used successfully in the past.

You are not permitted to use a computer for this team challenge. If you have a question about starting material availability, ask Keary.

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**A**


**B**

*Org. Lett.* 2007, 9, 2529.


**C**


**D**
