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The main topic of our research is concerned with the stabilisation of reactive organic moieties by coordination to transition metals and the insertions of unsaturated molecules into metal–carbon bonds. These reactions are essential to organic synthesis for the formation of new carbon–carbon bonds and are often present in catalytic systems. Our investigations are mainly based on experimental organometallic reactions with the help of multinuclear spectroscopic techniques, but in recent years invaluable mechanistic information has also been obtained by DFT computations.



### Organometallic Chemistry of Alkynes

The study of the insertion reactions of alkynes into the aryl–metal bonds of pallacycles has been continued both experimentally and theoretically, but the nature of the highly reactive complexes involved in the insertion reactions is usually not well defined. However, data obtained with various complexes containing the benzylamine moiety  $\text{Pd}(\text{C}_6\text{H}_4\text{CH}_2\text{NMe}_2-\text{C},\text{N})$  have shown that the regiochemistry of the insertions of ester-activated alkynes may be influenced by the electron-density on the metal, e.g. whether the complex is neutral or cationic. These reactions seem to take place *via* a four-coordinate mechanism, hence exchange of the ligand *cis* to the reactive phenyl–palladium bond by the alkyne is the rate-limiting step. Highly charged complexes show altered regioselectivities which may result from electrostatic interactions with the incoming alkyne. These recent results have important impacts for modern catalytic reactions carried out in water or ionic liquids. (with A.J. Edwards, A.C. Willis, and S.A. Macgregor [Heriot-Watt U., Edinburgh, UK])