

Recent Publications: Michael G. Richmond

119. "Ion-Pairing Thermodynamics for (η^5 -pentadienyl)Fe(CO)₂⁻ (pentadienyl = MeCp, C₅Me₅, C₅Ph₅, C₉H₇) and X-ray Crystal Structure of [(η^5 -C₅Ph₅)Fe(CO)₂][PPN]," M.P. Castellani, S. Hwang, S.E. Longacre, A.L. Rheingold, M.G. Richmond, Organometallics, **2002**, 21, 373.
120. "Reduction and Oxidation of the *Arachno* Clusters Fe₂(CO)₆(μ -S)₂PtL₂: Characterization of Distinct One- and Two-Electron Transfer Sites in Heteropolynuclear Compounds," A. Morneau, W.E. Geiger, M.G. Richmond, M.-J. Don, W.H. Watson, A. Nagl, Organometallics, **2002**, 21, 1247.
121. "Organometallic Metal Cluster Chemistry for the Year 2000," M.G. Richmond, J. Coord. Chem. **2002**, 228, 19. **Invited Review.**
122. "Phosphine Ligand Attack at Both the Methylidyne Cap and the CpNi Center in HCCO₂NiCp(CO)₆ by 2,3-Bis(diphenylphosphino)maleic anhydride (bma). P-C Bond Cleavage Reactivity, Kinetics, and X-ray Structures of the Zwitterionic Clusters Co₂NiCp(CO)₄(μ -CO)[μ_2, η^2, η^1 -C(H)PPh₂C=C(PPh₂)C(O)OC(O)] and Co₂NiCp(CO)₄[μ_2, η^2, σ -C(H)PPh₂C=CC(O)OC(O)](μ_2 -PPh₂)," S.G. Bott, K. Yang, K. Talafuse, M.G. Richmond, Organometallics **2003**, 22, 1383.
123. "Acetylide Participation in Ligand Substitution and P-C Bond Cleavage in the Reaction Between HRu₃(CO)₉($\mu_3, \eta^2, \eta^2, \eta^1$ -C \equiv CPh) and 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd). Syntheses and X-ray Structures of HRu₃(CO)₇[$\mu_3, \eta^2, \eta^2, \eta^1, \eta^1, \eta^1$ -Ph₂PC=CC(O)CH₂C(O)PPh₂C=CPh] and Ru₃(CO)₆(μ, η^2, η^1 -PhC=CHPh)[μ_2, η^2, η^1 -PPhC=CC(O)CH₂C(O)PPh₂], S.G. Bott, H. Shen, R.A. Senter, M.G. Richmond, Organometallics **2003**, 22, 1953.
124. "ETC and Thermal Ligand Substitution in PhCCO₃(CO)₉ with 2,3-Bis(diphenylphosphino)-N-phenylmaleimide (bppm). X-ray Diffraction Structure of Co₃(CO)₆[μ_2, η^2, η^1 -C(Ph)C=C(PPh₂)C(O)NPhC(O)](μ_2 -PPh₂)," W.H. Watson, S.G. Bodige, J. Liu, M.G. Richmond, Struct. Chem. **2003**, 14, 367.
125. "CO Substitution in Ru₃(CO)₁₂ by 2,3-Bis(diphenylphosphino)-N-phenylmaleimide (bppm). X-ray Diffraction Structure of Ru₂(CO)₆(bppm)," W.H. Watson, K. Ejsmont, J. Liu, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 541.
126. "Reaction of 2,3-Bis(diphenylphosphino)maleic acid-thioanhydride (bmata) with PhCCO₃(CO)₉. X-ray Diffraction Structure of Co₃(CO)₆[μ_2, η^2, η^1 -C(Ph)C=C(PPh₂)C(O)SC(O)](μ_2 -PPh₂)," S.G. Bott, T. Múnoz, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 549.
127. "X-ray Diffraction Structure of (5S)-3,4-Dichloro-5-menthoxy-2(5H)-furanone," S.G. Bott, K. Yang, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 585.

128. "Organometallic Metal Cluster Chemistry for the Year 2001," M.G. Richmond, J. Coord. Chem. **2003**, 241, 273. **Invited Review.**
129. "X-ray Structure and Redox Chemistry of the Heptacobalt Cluster $\text{Co}_3(\text{CO})_9[\mu_3\text{-CCO}_2\text{CH}_2\text{CCH}\{\text{Co}_4(\text{CO})_{10}\}]$," W.H. Watson, S. Bodige, J.-C. Wang, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 673.
130. "Regiospecific CO Substitution in $(\mu\text{-H})\text{Ru}_3(\mu_3\text{-}\eta^3\text{-CHCHCMe})(\text{CO})_9$ by 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd). X-ray Structure of $(\mu\text{-H})\text{Ru}_3(\mu_3\text{-}\eta^3\text{-CHCHCMe})(\text{CO})_7(\text{bpcd})\cdot\text{MeOH}$," C.-G. Xia, S.G. Bott, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 681.
131. "Bridging and Chelating Diphosphine Ligands in $(\mu\text{-H})\text{Ru}_3(\text{CO})_8(\text{P-P})(\mu\text{-NCPH}_2)$. X-ray Diffraction Structures of $(\mu\text{-H})\text{Ru}_3(\text{CO})_8(\text{dmpe})(\mu\text{-NCPH}_2)$ and $(\mu\text{-H})\text{Ru}_3(\text{CO})_8(\text{bpcd})(\mu\text{-NCPH}_2)$," W.H. Watson, Y. Zhao, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 765.
132. "Site-Selective Ligand Substitution in $\text{CoRu}(\text{CO})_7(\mu\text{-PPh}_2)$ using $(Z)\text{-Ph}_2\text{PCH=CHPPh}_2$ and Reactivity of DMAD with $\text{CoRu}(\text{CO})_5[(Z)\text{-Ph}_2\text{PCH=CHPPh}_2](\mu\text{-PPh}_2)$. X-ray Structures of $\text{CoRu}(\text{CO})_5[(Z)\text{-Ph}_2\text{PCH=CHPPh}_2](\mu\text{-PPh}_2)$ and $\text{CoRu}(\text{CO})_3(\mu\text{-CO})[(Z)\text{-Ph}_2\text{PCH=CHPPh}_2][\mu, \eta^3\text{-Ph}_2\text{PC}(\text{CO}_2\text{Me})\text{C}(\text{CO}_2\text{Me})]$," W.H. Watson, J. Liu, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 775.
133. "Construction of a Hexanuclear Cluster Composed of Spatially Separated Co_3 and Ru_3 Units. X-ray Diffraction Structure of $\text{Co}_3(\text{CO})_9[\mu_3\text{-CCO}_2\text{CH}_2\text{CC}\{\text{HRu}_3(\text{CO})_9\}]$," W.H. Watson, J.-C. Wang, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 957.
134. "Ortho-Metalation and Carboxylate Coordination in the Reaction Between the Dipotassium Salt of Phthalic Acid and $\text{Cp}^*\text{Ir}(\text{PMe}_3)\text{Cl}_2$: X-ray Diffraction Structure of $\text{Cp}^*\text{Ir}(\text{PMe}_3)[\text{C}_6\text{H}_3(\text{CO}_2)(\text{CO}_2\text{H})]$," W.H. Watson, M.-J. Don, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 963.
135. "Sequential Reaction of *p*-Toluidine with 2,3-Dichloromaleic Anhydride: Synthesis and Molecular Structure of 2-Chloro-3-*p*-toluidino-*N-p*-tolylmaleimide," W.H. Watson, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2003**, 33, 983.
136. "Unusual Chemical Reactivity in the Reactions of $\text{Re}_2(\text{CO})_8(\mu\text{-H})(\mu\text{-}\eta^1, \eta^2\text{-CH=CHBu})$ with 2,3-Bis(diphenylphosphino)maleic Anhydride (bma) and $\text{Re}_2(\text{CO})_8(\text{bma})$ with $\text{Ni}(\text{cod})_2$: X-ray Diffractions Structures of $\text{Re}_2(\text{CO})_8(\text{bma})$, Zwitterionic $\text{Re}(\text{CO})_4[\text{Re}(\text{CO})_4(\text{bma})]$, and the Phosphido-bridged Complex $\text{Re}_2(\text{CO})_8[\mu\text{-}\eta^1, \eta^1\text{-C=C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})](\mu\text{-PPh}_2)$," S.G. Bott, K. Yang, M.G. Richmond, J. Organomet. Chem. **2004**, 689, 791.

137. "Reaction of 1,2-Bis(diphenylphosphino)cyclobutenedione (bpcbd) with *fac*-BrRe(CO)₃(THF)₂: X-ray Diffraction Structure of the Dimeric Complex [BrRe(CO)₃]₂(bpcbd)•CH₂Cl₂," S.G. Bott, K. Yang, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 127.
138. "Thermally Induced Dual P-C Bond Cleavage Routes from the Imido-capped Cluster Ru₃(CO)₇(μ₃-CO)(μ₃-NPh)(bpcd). Synthesis, Spectroscopic Properties, and X-ray Diffraction Structures of Ru₃(CO)₇(μ₃-CO)(μ₃-NPh)(bpcd), Ru₃(CO)₅(μ₂-CO)₂(μ₃-NPh)(μ₂-PPh₂)[μ-η¹,η¹-C=C(PPh₂)C(O)CH₂C(O)], Ru₃(CO)₆(μ₂-CO)(μ₃-NPh)(μ-PhCO)[μ₂-η²,η¹-PPhC=C(PPh₂)C(O)CH₂C(O)], and Ru₃(CO)₉(μ₃-NPh)(μ₃-PPh)," S.G. Bott, H. Shen, M.G. Richmond, J. Organomet. Chem. **2004**, 689, 3426.
139. "Organometallic Metal Cluster Chemistry for the Year 2002," M.G. Richmond, J. Coord. Chem. **2004**, 248, 881. **Invited Review.**
140. "Reaction of the Dicobalt Alkyne Compound Co₂(CO)₆(μ-dmad) with the Diphosphine Ligand 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd). Spectroscopic Properties, X-ray Diffraction Data, and Thermal Reactivity of the Chelating Isomer of Co₂(CO)₄(bpcd)(μ-dmad)," C.-G. Xia, S.G. Bott, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 513.
141. "Unexpected Chlorine Substitution by Hydrogen in the Reaction of 2-Chloro-3-*p*-toluidino-*N-p*-tolylmaleimide with DBU: Synthesis and Molecular Structure of 2-*p*-toluidino-*N-p*-tolylmaleimide," W.H. Watson, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 621.
142. "Ligand Substitution in the Halo-bridged Diruthenium Compound [Ru(CO)₃Cl₂]₂ by 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd). Synthesis, Spectral Properties, and X-ray Diffraction Structures of RuCl₂(CO)₂(bpcd) and *cis*-RuCl[C(O)Et](CO)₂(bpcd)," W.H. Watson, S.-H. Huang, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 627.
143. "Reaction of Dichloromaleic Anhydride and 1,8-Diaminonaphthalene: Synthesis and X-ray Diffraction Structure of 8,9-Dichloropyrrolo[1,2-*a*]perimidin-10-one," W.H. Watson, T. Chen, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 697.
144. "New Polydentate Sulfide Ligands: Synthesis, Redox Properties, and Molecular Structure of 4,5-Bis(*p*-tolylthio)-4-cyclopenten-1,3-dione," W.H. Watson, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 709.
145. "Reaction of *o*-Phenylenediamine with 2,3-Dichloromaleic Anhydride: Synthesis of *N*-Substituted Maleimide Derivatives and 2,3-Dichloropyrrolo[1,2-*a*]benzimidazol-1-one. X-ray Structures of 2,3-Dichloro-*N-o*-C₆H₄(NH₂)maleimide and *N,N'*-*o*-C₆H₄-Bis(2,3-dichloromaleimide)," W.H. Watson, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2004**, 34, 757.

146. "Synthesis, Redox Properties, and X-ray Diffraction Structure of 2,3-Bis(ethylthio)-N-(*p*-MeOC₆H₄)maleimide," W.H. Watson, T. Chen, M.G. Richmond, J. Chem. Crystallogr. **2004**, *34*, 765.
147. "New Sulfur Derivatives of 2,3-Dichloropyrrolo[1,2-*a*]benzimidazol-1-one. Demonstration of Regioselective Thiolate Addition and X-ray Diffraction Structures of 2-chloro-3-methylthiopyrrolo[1,2-*a*]benzimidazol-1-one and 2,3-Di(benzylthio)pyrrolo[1,2-*a*]benzimidazol-1-one," W.H. Watson, G. Wu, S.-H. Huang, M.G. Richmond, J. Chem. Crystallogr. **2004**, *34*, 773.
148. "Diphosphine Ring Expansion and π -Bond Reduction in the Reaction Between 1,2-Bis(diphenylphosphino)cyclobutenedione (bpcbd) and Ru₃(CO)₁₀(MeCN)₂: X-ray Diffraction Structures of Ru₃(CO)₁₀[2,3-bis(diphenylphosphino)succinic anhydride]•CH₂Cl₂ and Ru₂(CO)₆(bma)," W.H. Watson, T. Chen, M.G. Richmond, J. Chem. Crystallogr. **2004**, *34*, 797.
149. "CO Substitution in the Mixed-metal Clusters PhCCo₂Ni(CO)₆Cp and PhCCo₂Mo(CO)₈Cp by (Z)-Ph₂PCH=CHPPh₂. X-ray Diffraction Structures and Proof of Ligand Bridging in PhCCo₂Ni(CO)₄[(Z)-Ph₂PCH=CHPPh₂]Cp and PhCCo₂Mo(CO)₆[(Z)-Ph₂PCH=CHPPh₂]Cp," S.G. Bott, K. Yang, S.-H. Huang, M.G. Richmond, J. Chem. Crystallogr. **2004**, *34*, 883.
150. "Thermolysis of the Tetrahedrane Cluster PhCCo₃(CO)₃(μ -CO)Cp₂ with the Unsaturated Diphosphine Ligands (Z)-Ph₂PCH=CHPPh₂ and 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd). Redox Properties and Molecular Structure of PhCCo₃(CO)(μ -CO)[(Z)-Ph₂PCH=CHPPh₂]Cp₂," W.H. Watson, S. Kandala, M.G. Richmond, J. Chem. Crystallogr. **2005**, *35*, 157.
151. "Polyene Ring Attack in *diag*-CpRe(CO)₂Br₂ by Hydride and Cyclopentadiene Displacement to Furnish *trans*(Br)-[Re(CO)₄Br₂] Under CO. X-ray Diffraction Structure of *trans*(Br)-[Re(CO)₄Br₂][PPh₄]," S.G. Bott, S.-W. Lee, K. Yang, M.G. Richmond, J. Chem. Crystallogr. **2005**, *35*, 203.
152. "Alkyne Insertion and Coupling Reactions of Methyl Propiolate with the Heterometallic Dimers CoRu(CO)₇(μ -PPh₂) and CoRu(CO)₅[(Z)-Ph₂PCH=CHPPh₂](μ -PPh₂): X-ray Diffraction Structures of CoRu(CO)₄(μ -CO)[μ -PPh₂C(O)CH(CO₂Me)C(O)CH(CO₂Me)] and CoRu(CO)₃(μ -CO)[(Z)-Ph₂PCH=CHPPh₂][μ -PPh₂C(O)C(CO₂Me)CH]," W.H. Watson, J. Liu, M.G. Richmond, J. Chem. Crystallogr. **2005**, *35*, 249.
153. "Ligand Substitution in the Mixed-Metal Cluster PhCCo₂Ni(CO)₆Cp by 2,3-Bis(diphenylphosphino)maleic Anhydride (bma): An Intimate Picture Involving the Stepwise Conversion of the Trinuclear Cluster PhCCo₂Ni(CO)₄(η^2 -bma)Cp to the Mononuclear Metallocyclic Compound CpNi[PPh₂CPhC=C(PPh₂)(O)OC(O)], S.G. Bott, K. Yang, M.G. Richmond, J. Organomet. Chem. **2005**, *690*, 3067.

154. "Synthesis, X-ray Diffraction Structure, and Redox Chemistry of $\text{Re}_2(\text{CO})_8(\text{bmf})$," S.G. Bott, K. Yang, M.G. Richmond, J. Chem. Crystallogr. **2005**, *35*, 709.
155. "Organometallic Metal Cluster Chemistry for the Year 2003," M.G. Richmond, J. Coord. Chem. **2005**, *249*, 2763. **Invited Review.**
156. "Reversible Aryl C-H Bond Activation in the Reaction Between $\text{HRu}_3(\text{CO})_{9,10}(\mu\text{-PPh}_2)$ and the Diphosphine Ligand 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): X-ray Diffraction Structures of $\text{H}_2\text{Ru}_3(\text{CO})_7(\text{bpcd})[\mu, \sigma\text{-PPh}(\text{C}_6\text{H}_4)]$ and $\text{Ru}_3(\text{CO})_6(\mu\text{-CO})(\mu\text{-PPh}_2)[\mu, \eta^2, \eta^1\text{-PPhC}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})]$," S.G. Bott, H. Shen, M.G. Richmond, J. Organomet. Chem. **2005**, *690*, 3838.
157. "Dimethyl Acetylenedicarboxylate (dmad) Reactivity with the Mixed-Metal Cluster $\text{Co}_2\text{Rh}_2(\text{CO})_{12}$: Facile Cluster Fragmentation and Highly Specific Metal Redistribution to Give the Butterfly Cluster $\text{Co}_3\text{Rh}(\text{CO})_{10}(\mu\text{-dmad})$ and the Planar Cluster $\text{CoRh}_3(\text{CO})_9(\mu\text{-dmad})_3$," W.H. Watson, B. Poola, M.G. Richmond, Organometallics **2005**, *24*, 4687.
158. "Reversible Isomerization of a Diphosphine Ligand About a Triosmium Cluster: Synthesis, Kinetics, and X-ray Structures for the Bridging and Chelating Isomers of $\text{Os}_3(\text{CO})_{10}[(Z)\text{-Ph}_2\text{PCH}=\text{CHPPh}_2]$," W.H. Watson, G. Wu, M.G. Richmond, Organometallics **2005**, *24*, 5431.
159. "Reaction of 2,3-Bis(methylthio)pyrrolo[1,2-*a*]benzimidazol-1-one with $\text{BrRe}(\text{CO})_3(\text{THF})_2$. X-ray Diffraction Structure, Redox Chemistry, and Luminescence Behavior of *fac*- $\text{BrRe}(\text{CO})_3\{\text{N,S-2,3-bis(methylthio)pyrrolo[1,2-}a\text{]benzimidazol-1-one}\}$," G. Wu, D.R. Glass, D. May, W.H. Watson, D. Wiedenfeld, M.G. Richmond, J. Organomet. Chem. **2005**, *690*, 4993.
160. "Photochemically Induced Metallization of Surface Silicon Using Dinuclear Metal Carbonyl Compounds. Anchoring of Ruthenium to a Si(111) Surface Through Covalent Ru-Si Bond Formation," P. Nalla, S.-H. Huang, Y. Zhang, O. Chyan, M.G. Richmond, M. El Bouanani, Chem. Mater. **2005**, *17*, 5951.
161. "Synthesis of the Chiral Tetrahedral Clusters $\text{RCCo}_2\text{NiCp}(\text{CO})_4(\text{bmf})$ (R = H, Ph) and Thermally Promoted Diphosphine Ligand Activation: Regiospecific P-C Bond Scission and X-ray Diffraction Structure of $\text{Co}_2\text{NiCp}(\text{CO})_4[\mu_2, \eta^2, \eta^1\text{-C}(\text{H})\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OCH}(\text{OMe})](\mu\text{-PPh}_2)$," S.G. Bott, K. Yang, M.G. Richmond, J. Organomet. Chem. **2006**, *691*, 20.
162. "Synthesis, Redox Properties, and Molecular Structure of 4,5-Diethylthio-4-cyclopenten-1,3-dione: Cyclic Voltammetric Evidence for a Kinetically Stable Radical Anion," W.H. Watson, G. Wu, P. Vadapally, M.G. Richmond, J. Chem. Crystallogr. **2006**, *36*, 55.

163. “Chlorine-Atom Abstraction and Cluster Fragmentation in the Reaction of $\text{H}_3\text{Re}_3(\text{CO})_{10}(\text{MeCN})_2$ with the Diphosphine Ligand 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): X-ray Diffraction Structure of *fac*- $\text{ClRe}(\text{CO})_3(\text{bpcd})$,” W.H. Watson, S. Kandala, M.G. Richmond, *J. Chem. Crystallogr.* **2006**, *36*, 71.
164. “Syntheses and X-ray Structures of the Bridging and Chelating Isomers of $\text{Os}_3(\text{CO})_{10}(\text{dmppe})$,” W.H. Watson, B. Poola, M.G. Richmond, *J. Chem. Crystallogr.* **2006**, *36*, 123.
165. “Diphosphine Isomerization and C-H and P-C Bond Cleavage Reactivity in the Triosmium Cluster $\text{Os}_3(\text{CO})_{10}(\text{bpcd})$: Kinetic and Isotope Data for Reversible Ortho Metalation and X-ray Structures of the Bridging and Chelating Isomers of $\text{Os}_3(\text{CO})_{10}(\text{bpcd})$ and the Benzyne-substituted Cluster $\text{HOs}_3(\text{CO})_8(\mu_3\text{-C}_6\text{H}_4)[\mu_2, \eta^1\text{-PPhC=C(PPh}_2\text{)C(O)CH}_2\text{C(O)}]$,” W.H. Watson, G. Wu, M.G. Richmond, *Organometallics* **2006**, *25*, 930. **Recognized as one of the fifteen most-cited articles published in *Organometallics* in 2006 based on data from Thomson ISI.**
166. “Dynamic Behavior of the Diphosphine Ligand in $\text{H}_4\text{Ru}_4(\text{CO})_{10}(\text{dppe})$ Revisited: Kinetic Data Supporting a Nondissociative Isomerization of the Dppe Ligand,” S. Kandala, M.G. Richmond, *Inorg. Chem.* **2006**, *45*, 5976.
167. “Ligand Substitution in $\text{HC(O)CCO}_3(\text{CO})_9$ with 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): Diphosphine Ligand Fluxionality, Decarbonylation of the Formyl Moiety and Competitive P-Ph Bond Cleavage Reactivity,” W.H. Watson, S. G. Bodige, K. Ejsmont, J. Liu, M.G. Richmond, *J. Organomet. Chem.* **2006**, *691*, 3609.
168. “Regiospecific and Sequential P-C Bond Activation/Cluster Transformations in the Reaction of $\text{PhCCO}_2\text{MoCp}(\text{CO})_8$ with the Diphosphine Ligands 2,3-Bis(diphenylphosphino)maleic anhydride (bma) and 3,4-Bis(diphenylphosphino)-5-methoxy-2(5H)-furanone (bmf),” S.G. Bott, K. Yang, M.G. Richmond, *J. Organomet. Chem.* **2006**, *691*, 3771.
169. “CO Replacement in the Tetrahedrane Cluster $\text{MeC(O)CCO}_3(\text{CO})_9$ by the Diphosphine Ligand 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): Diphosphine Ligand Isomerization and X-ray Structure of the Bridged Cluster $\text{MeC(O)CCO}_3(\text{CO})_7(\text{bpcd})$,” W.H. Watson, K. Ejsmont, J. Liu, M.G. Richmond, *J. Chem. Crystallogr.* **2006**, *36*, 509.
170. “Synthesis and Diphosphine Ligand Fluxionality in $\text{Os}_3(\text{CO})_{10}(\text{bmi})$: Kinetic Evidence for Nondissociative Diphosphine Isomerization and X-ray Crystal Structure of 1,1- $\text{Os}_3(\text{CO})_{10}(\text{bmi})$,” W.H. Watson, B. Poola, M.G. Richmond, *J. Organomet. Chem.* **2006**, *691*, 4676.

171. “Diverse Ligand Substitution Behavior in the Reaction of $\text{H}_4\text{Os}_4(\text{CO})_{12}$ with 4,5-bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd) and Me_3NO : Spectroscopic Characterization of the Diphosphine Chelating and Bridging Isomers $\text{H}_4\text{Os}_4(\text{CO})_{10}(\text{bpcd})$ and the X-ray Diffraction Structures of the Tetraosmium Clusters $\text{H}_4\text{Os}_4(\text{CO})_{11}(\text{NMe}_3)$ and $\text{H}_4\text{Os}_4(\text{CO})_{10}(\text{NMe}_3)(\eta^1\text{-bpcd})$,” W.H. Watson, S. Kandala, M.G. Richmond, J. Chem. Crystallogr. **2006**, *36*, 605.
172. “Knoevenagel Condensation of the Diphosphine Ligand 4,5-bis(diphenylphosphino)-4-cyclopenten-1,3-dione with 9-Anthracenecarboxaldehyde: Synthesis of the Second-Generation Ligand 2-(Anthracen-9-ylidene)-4,5-bis(diphenylphosphino)-4-cyclopentene-1,3-dione,” W.H. Watson, B. Poola, M.G. Richmond, J. Chem. Crystallogr. **2006**, *36*, 715.
173. “Diphosphine Ligand Substitution in $\text{H}_4\text{Ru}_4(\text{CO})_{12}$. X-ray Diffraction Structures and Reactivity Studies of the Cluster Compounds $\text{H}_4\text{Ru}_4(\text{CO})_{10}(\text{P-P})$ [where P-P = (Z)- $\text{Ph}_2\text{PCH}=\text{CHPPh}_2$, bpcd],” W.H. Watson, S. Kandala, M.G. Richmond, J. Chem. Crystallogr. **2006**, *36*, 813.
174. “Ligand-induced Polyhedral Opening in the Mixed-metal Cluster $\text{MeCCO}_2\text{NiCp}(\text{CO})_6$ by 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): X-ray Structure of $\text{Co}_2\text{NiCp}(\text{CO})_4[\mu_2, \eta^2, \eta^1\text{-C}(\text{Me})\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})](\mu_2\text{-PPh}_2)$,” W.H. Watson, K. Ejsmont, J. Liu, M.G. Richmond, J. Chem. Crystallogr. **2006**, *36*, 823.
175. “Ligand Substitution in the Tetrahedrane Clusters $\text{RCCO}_2\text{Mo}(\eta^5\text{-indenyl})(\text{CO})_8$ with 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): Influence of the Carbyne and Indenyl Ligands on the Stability of the Substitution Products and X-ray Diffraction Structures of $\text{HCCO}_2\text{Mo}(\eta^5\text{-indenyl})(\text{CO})_6(\mu\text{-bpcd})$ and $\text{CoMo}(\eta^5\text{-indenyl})(\mu\text{-CPh})(\text{CO})_2(\mu\text{-bpcd})\text{Cl}$,” W.H. Watson, B. Poola, M.G. Richmond, J. Organomet. Chem. **2006**, *691*, 5579.
176. “Ligand Chelation, P-C Bond Cleavage, and Phenyl-Group Transfer in the Reaction Between $\text{RCCO}_3(\text{CO})_9$ and 1,8-Bis(diphenylphosphino)naphthalene (dppn): Syntheses and X-ray Diffraction Structures of $\text{PhCCO}_3(\text{CO})_4(\mu\text{-CO})_3(\text{dppn})$ and $\text{PhCCO}_3(\text{CO})_8[\eta^1\text{-PPh}(\text{OH})\text{C}_{10}\text{H}_6\text{P}(\text{O})\text{Ph}_2]$,” W.H. Watson, S. Kandala, M.G. Richmond, J. Organomet. Chem. **2007**, *692*, 968.
177. “Ligand Degradation and Phosphorus Scavenging in the Reaction Between 1,2-Bis(diphenylphosphino)benzene (dppbz) and $\text{Ru}_6(\mu_6\text{-C})(\text{CO})_{17}$: Synthesis and X-ray Structure of the Edge-bridged Square-pyramidal Cluster $\text{HRu}_6(\mu_5\text{-C})(\mu_3\text{-P})(\text{CO})_{14}(\text{dppbz})$,” W.H. Watson, S. Kandala, M.G. Richmond, J. Organomet. Chem. **2007**, *692*, 1648.
178. “Regiospecific Alkyne Insertion into the Co-Co Bond of the Mixed-metal Cluster $\text{Co}_2\text{Rh}_2(\text{CO})_{12}$ by an Electron-poor Alkyne: X-ray Diffraction Structure of the Butterfly Cluster $\text{Co}_2\text{Rh}_2(\text{CO})_{10}(\mu\text{-HCCCO}_2\text{Me})$,” W.H. Watson, B. Poola, M.G. Richmond, Polyhedron **2007**, *26*, 1117.

179. “Photochemical Reactivity of the Triosmium Cluster 1,1-Os₃(CO)₁₀(bpcd) in the Presence of P(OEt)₃ and X-ray Crystal Structure of HOs₃(CO)₇[P(OEt)₃][μ-{PPh(C₆H₄)}C=C(PPh₂)C(O)CH₂C(O)]: Evidence for Ortho Metalation and Cluster Face Capping by a Diphosphine Ligand,” W.H. Watson, A. Strugatskiy, G. Wu, M.G. Richmond, J. Chem. Crystallogr. **2007**, *37*, 247.
180. “Pincer Ligand Coordination at a Triosmium Cluster: X-ray Structures of 1,2-Os₃(CO)₁₀[4,6-bis(diphenylphosphinomethyl)-*m*-xylene] and 1,2-Os₃(CO)₁₀[1-diphenylphosphino-1-{(2,4-dimethyl-5-diphenylphosphinomethyl)phenyl}-propan-2-ol],” V. Nesterov, B. Poola, X. Wang, M.G. Richmond, J. Organomet. Chem. **2007**, *692*, 1806. **Invited Gulya Palyi Commerative Manuscript.**
181. “Pincer Ligand Coordination at Co₃ and Ru₆ Clusters: Syntheses, Reactivity Studies, and X-ray Diffraction Structures of [PhCCO₃(CO)₈]₂(dppx) and [Ru₆(μ₆-C)(CO)₁₆]₂(dppx),” W.H. Watson, B. Poola, J. Liu, M.G. Richmond, J. Chem. Crystallogr. **2007**, *37*, 349.
182. “Reaction of HRu₃(CO)₁₀(μ-COMe) with bma: NMR and X-ray Structural Evidence for the Formation of the Ph₂PH-substituted Cluster HRu₃(CO)₈(PHPh₂)[μ-PPh₂C=CC(O)OC(O)],” S.G. Bott, H. Shen, S. Kandala, N.H. Phan M.G. Richmond, J. Coord. Chem. **2007**, *60*, 1223.
183. “Synthesis and Characterization of the Osmium Compound *cis*(CO)-ClOs(CO)₂(bpcd)[C(O)Et],” W.H. Watson, S.-H. Huang, M.G. Richmond, J. Chem. Crystallogr. **2007**, *37*, 479.
184. “Photochemically Promoted Regiospecific P-C Bond Cleavage in the Diruthenium Compound Ru₂(CO)₂(bmf): X-ray Diffraction Structure of Ru₂(CO)₆[μ-C=C(PPh₂)C(O)OCH(OMe)](μ-PPh₂),” S.G. Bott, H. Shen, M.G. Richmond, J. Coord. Chem. **2007**, *60*, 1457.
185. “α-Diimine Chelation at a Triosmium Cluster: Synthesis and X-ray Structure of 1,1-Os₃(CO)₉(μ-CO)(1,10-phen),” B. Poola, X. Wang, M.G. Richmond, J. Chem. Crystallogr. **2007**, *37*, 641.
186. “Synthesis, Electrochemistry, MO Properties, and X-ray Diffraction Structures of the New redox-active Diphosphine Ligand 2-(2-Thienylidene)-4,5-bis(diphenylphosphino)-4-cyclopenten-1,3-dione (tbpcd) and *fac*-BrRe(CO)₃(tbpcd),” W.H. Watson, D. Wiedenfeld, A. Pingali, B. Poola, M.G. Richmond, Polyhedron, **2007**, *26*, 3577.
187. “Synthesis and Reactivity Studies of the Diphosphine Ligand 2-(Ferrocenylidene)-4,5-bis(diphenylphosphino)-4-cyclopenten-1,3-dione (fbpcd): Bridge-to-Chelate Ligand Isomerization Kinetics in Os₃(CO)₁₀(fbpcd) and X-ray Diffraction Structure of the Ortho-Metalated Cluster HOs₃(CO)₉[μ-PhP(C₆H₄)C=C(PPh₂)C(O)C=CH(C₅H₄FeCp)C(O)],” W.H. Watson, B. Poola, M.G. Richmond, Polyhedron **2007**, *26*, 3585.

188. "CO Substitution in $\text{H}_4\text{Ru}_4(\text{CO})_{12}$ by the Diphosphine Ligands 1,2-Bis(diphenylphosphine)benzene (dppbz) and 1,8-Bis(diphenylphosphino)naphthalene (dppn): X-ray Diffraction Structures of the Diphosphine-chelated Clusters 1,1- $\text{H}_4\text{Ru}_4(\text{CO})_{10}(\text{dppbz})$ and 1,1- $\text{H}_4\text{Ru}_4(\text{CO})_{10}(\text{dppn})$," V. Nesterov, W.H. Watson, S. Kandala, M.G. Richmond, *Polyhedron* **2007**, 26, 3602.
189. "PMe₃-induced CO Insertion and CO Deinsertion in the Zwitterionic Hydrocarbyl Complex $\text{Co}_2(\text{CO})_4[\mu\text{-PhC}=\text{C}(\text{H})\text{PPh}_2\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})]$. Syntheses and X-ray Structures of $\text{Co}_2(\text{CO})_3(\text{PMe}_3)[\mu\text{-PhC}(\text{CO})=\text{C}(\text{H})\text{PPh}_2\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})]$ and $\text{Co}_2(\text{CO})_3(\text{PMe}_3)[\mu\text{-PhC}=\text{C}(\text{H})\text{PPh}_2\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})]$," S.G. Bott, K. Yang, M.G. Richmond, *Polyhedron* **2007**, 26, 3737.
190. "CO Substitution and Cluster-Ligand Reductive Coupling in the Reaction of 2,3-Bis(diphenylphosphino)maleic Anhydride (bma) with the Mixed-metal Clusters $\text{PhCCo}_2\text{MCP}(\text{CO})_8$ (where M = Cr, W): Synthesis and X-ray Diffraction Structures of the Phosphido-bridged Clusters $\text{Co}_2\text{MCP}(\text{CO})_5[\mu_2, \eta^2, \eta^1\text{-C}(\text{Ph})\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})](\mu\text{-PPh}_2)$," W. Zhang, W.H. Watson, M. G. Richmond, *J. Chem. Crystallogr.* **2008**, 38, 9.
191. "Diphosphine Chelation and Bridging and Regiospecific Ortho Metalation in the Reaction of 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd) with $\text{Ir}_4(\text{CO})_{12}$: X-ray Diffraction Structures of $\text{Ir}_4(\text{CO})_7(\mu\text{-CO})_3(\text{bpcd})$, $\text{Ir}_4(\text{CO})_5(\mu\text{-CO})_3(\text{bpcd})(\mu\text{-bpcd})$, and $\text{HIr}_4(\text{CO})_4(\mu\text{-CO})_3(\text{bpcd})[\mu\text{-PhP}(\text{C}_6\text{H}_4)\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})]$," W.H. Watson, G. Wu, M.G. Richmond, *J. Organomet. Chem.* **2008**. In Press. **Special F.A. Cotton Memorial Issue.**
192. "Reaction of 6-Methyl-2,2'-bipyridine with $1,2\text{-Os}_3(\text{CO})_{10}(\text{MeCN})_2$: Syntheses, Reductive Elimination/Ligand Displacement Kinetics, and X-ray Diffraction Structures of the Isomeric Clusters $\text{HOs}_3(\text{CO})_9(\mu_2\text{-N}_2\text{C}_{11}\text{H}_9)$ and $\text{H}_2\text{Os}_3(\text{CO})_8(\mu_3\text{-N}_2\text{C}_{11}\text{H}_8)$," C. J. Carrano, B. Poola, M.G. Richmond, Submitted to *Organometallics* **2008**.
193. "Diphosphine Substitution and Carbyne Ligand Transfer in the Reaction of 2,3-Bis(diphenylphosphino)maleic Anhydride (bma) with the Methylidyne-capped Clusters $\text{HCCo}_2\text{MCP}(\text{CO})_8$ (where M = Mo, W): Synthesis and X-ray Diffraction Structures of the Vinylidene-bridged Clusters $\text{Co}_2\text{MCP}(\text{CO})_6[\mu\text{-C}=\text{C}(\text{H})\text{CH}_2\text{C}(\text{PPh}_2)\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{OC}(\text{O})]$," W. Zhang, W.H. Watson, M.G. Richmond, Submitted to *J. Chem. Crystallogr.* **2008**.
194. "CO Substitution in $\text{HRu}_3(\text{CO})_{10}(\mu\text{-COMe})$ by the Unsaturated Diphosphine Ligand 4,5-Bis(diphenylphosphino)-4-cyclopenten-1,3-dione (bpcd): Synthesis and Reactivity Studies of the Face-capped Cluster $\text{Ru}_3(\text{CO})_7(\mu_3\text{-COMe})[\mu\text{-P}(\text{Ph})\text{C}=\text{C}(\text{PPh}_2)\text{C}(\text{O})\text{CH}_2\text{C}(\text{O})]$," S.G. Bott, H. Shen, S.-H. Huang, M.G. Richmond, In Prep. *J. Organomet. Chem.* **2008**.