Review
“F Orbitals and Metal-Ligand Bonding in Octahedral Complexes” by K. Mousseau

The idea of examining f-orbitals in the bonding interactions of coordination complexes is an interesting topic in that it takes what we have learned in class about the d orbitals (field splitting, pi and sigma overlap, molecular orbitals, etc) and applies it to a new area. In this regard the paper was at least interesting in the scientific concern for exploring new territory. However, this paper did not really express why f-orbital bonding is worth examining, why it is important or what kinds of applications it might have.

The “methods” section did well in that it presented a lot of facts and figures. However the coherence and flow of these facts was choppy and did not tell the reader a very clear story. I had to read through a few times before getting to the heart of what was being shown. The choice of tables and figures was good, however, their placement in regards to formatting could have been better. In several cases the figure or table being referenced was on the next or previous page, making it difficult to follow. Overall, the information was good, but the formatting and flow could have been improved.

I found some of the information very interesting, such as the “Lanthanide Contraction” phenomenon, and the character of the f-orbitals themselves in relation to the metal atom (shielding, etc). I would have liked to see more information on these topics as they may better express why f-orbitals are worth studying.

The examination of sigma and pi bonding character in 4f vs. 3d was interesting and for me did the best job of expressing the fundamental difference in bonding between these two orbitals. The methods of obtaining the data was a bit brushed over. I would have liked to read more about how the results were obtained.

The literature was well incorporated and referenced often. The use of tables and figures was good (though as I mentioned before, their placement could have been better thought out).

The conclusion was well written and stated that the information in the literature supported the final analysis. It did a good job of tying the paper together at the end. However, there was never any discussion regarding the merit or importance of the literature being review, no suggestions for further research or applications which might benefit from these results.

Overall I think this paper would benefit by a thorough read-through, correcting the spelling, grammar, and flow issues. Another suggestion would be to pick a few of the more interesting or unexpected results and expand on them in more detail rather than trying to state a little bit about everything regarding f-orbital bonding character.