Your assignment is to present to the class the following paper: “Sulfur-ligated [2Fe-2C] clusters as synthetic model systems for nitrogenase” (<https://pubs.acs.org/doi/10.1021/acs.inorgchem.2c03693>). You are provided the manuscript as well as the supporting information. Below are questions similar to those you are used to from literature discussions this semester. You should use these to guide the construction of your presentation. Make sure that you provide a background on the field generally. The questions below are useful for guiding this, may not be comprehensive (i.e., you may delve into areas not directly addressed by the questions). Questions may not necessarily be in the order in which topics should be presented. When a technique that is new to you is employed, you should assume that it is new to the rest of the class as well, and briefly explain it. You are encouraged to use figures. You may copy/paste figures from the materials provided, or from other sources in the interest of time. Ensure that any figure not generated by you or from this manuscript has a citation. You are encouraged to reach out to Prof. MacArthur for help. However, you should first put a reasonable amount of effort into answering your questions yourself by doing your own research.

The objective of this assignment is to enhance your skills of reading and digesting scientific literature, as well as exposing the class to an area of research we are not able to cover in one semester of this course.

1. Give some background:
   1. What is nitrogen fixation? Why is it important?
   2. What is nitrogenase?
   3. Why are synthetic models of nitrogenase important?
   4. In the context of the above questions, what is the goal of this work?
2. Compound **1** synthesis and characterization:
   1. Discuss the synthesis of compound **1**.
   2. Discuss NMR and Mössbauer spectroscopy (and define and describe the latter).
   3. Discuss the solid-state structure, and compare to nitrogenase. Is this a good model?
   4. Perform an electron counting and dn analysis on Compound **1**.
3. Reactivity:
   1. Compound **1** did not bind N2, CO, or CO2. It did bind DMAP. What is DMAP? Why might this ligand bind?
   2. What is the valence electron count and dn of the DMAP complex, **3**?
   3. What had to be done in order to crystallize **3**?
   4. Discuss the characterization of this complex as well.
   5. What happens when methyl isocyanide is added? Note the stoichiometry in your discussion.
   6. Discuss the NMR spectra of the isocyanide complex, **4**. Do another valence electron and dn count.
4. Conclude with some big picture take-aways from this paper.
   1. What concepts from this class did you need to consider?
   2. What is the conclusion for this work? Did the authors achieve their goal?