# EBS/CMOP Undergraduate Intern Mentoring Opportunity

---

**Project Title: The potential role of Mn oxidation in *Pseudomonas putida* GB-1 in degradation of lignin.**

**Context for Project:**

Bacterial manganese (II) oxidation has a profound impact on biogeochemical cycling of Mn, as well as on the availability of the trace metals adsorbed to the surfaces of solid Mn (III, IV) oxides. To begin to understand at the molecular level how and why bacteria oxidize Mn, the Tebo lab employs the genetically tractable Mn oxidizing bacterium *Pseudomonas putida* GB-1. One possible reason why bacteria oxidize Mn(II) is to enable the breakdown of difficult to digest organic material such as lignin.

**Brief Description.**

As part of the effort to understand why bacteria oxidize Mn, the student will undertake experiments to detect the break down of lignin in the laboratory and determine if lignin degradation correlates with Mn(II) oxidation activity. The student will also determine if lignin or other components of wood (such as cellulose and hemicellulose) induce Mn(II) oxidation and impact expression of the Mn(II) oxidase genes *mnxG* and *mcoA*. Finally, the student will examine bacterial growth in the presence of lignin to investigate whether lignin degradation provides energy to the cell.

**Proposed Outcomes/Broader Impact:**

These experiments will shed light on a long-standing question in the field: what is the function of Mn(II) oxidation for the cell. If successful, the results could also impact the use of lignin in biofuel production.

**Proposed timeline (within a 10 week span):**

Pilot experiments to test screening conditions and set up long-term growth experiments – 1 week
Quantify Mn(II) oxidation in the presence of lignin, cellulose and hemicellulose – 3 weeks
Quantify *mnxG* and *mcoA* expression in the presence of lignin, cellulose and hemicellulose – 3 weeks
Once assays have been worked out, determine the effect of Mn(II) oxidation on lignin degradation – 2 weeks
Assess long-term growth experiments – 1 week