ChE 791: Nanotechnology in Chemical Engineering

Literature Discussions

Literature Discussions

- Choose a journal paper about the topic of the previous week's lecture period
  - Try to select papers from leading journals in the field (*Nature*, *Nature Materials*, *Journal of the American Chemical Society*, *Langmuir*, *Nano Letters*, *Soft Matter*, *Lab on a Chip*)
- Prepare a ~5 minute summary of the paper, including
  - Context of work performed in paper with respect to previous work
  - Objective of paper
  - Main results of paper
  - Critique of paper (techniques? Conclusions match results?)
  - Propose next steps – what would you recommend doing to further the knowledge gained in this paper?
- Orally or bring maximum of 5 slides with you

Literature Discussions

- Send the paper to the whole class (and instructor) via e-mail at least 48 hours before the class time
- Everybody will read the paper and prepare notes about the key aspects of the paper/critiques they have
- Discussion on the paper will be led primarily by the student presenting the paper
- Everybody should contribute their thoughts on strengths/weaknesses of the paper presented

- Evaluation:
  - Presenting student: quality of presentation, leading discussion, scientific accuracy of assessment of paper
  - Other students: participation in discussion, evidence of preparation

Critiquing Papers

- **Abstract –** Can you understand the purpose of the paper and the main results of the paper based on the abstract alone?
- **Introduction**
  - Are appropriate terms defined?
  - Do you understand the context of the paper's subject?
    - General background + specific background related to particular materials/methods used
  - Have all relevant precedents for research been cited?
    - You need to read (or check) many papers to understand a single paper
  - Do you clearly understand the novel, innovative aspect of the science described in the paper?
    - Is there a novel aspect?

Critiquing Papers

- **Experimental**
  - Are sufficient details given to reproduce the experiments?
    - Rule of thumb: somebody skilled in the field should be able to directly reproduce your results if desired
  - Is the synthesis procedure reasonable?
    - Safety
    - Chemistry correct and verifiable
    - Purification procedures are appropriately chosen
  - Are the experiments chosen appropriate for analyzing the particular material? The stated parameter(s) of interest?
  - Are appropriate experiments chosen to adequately fulfill the stated objectives of the paper?

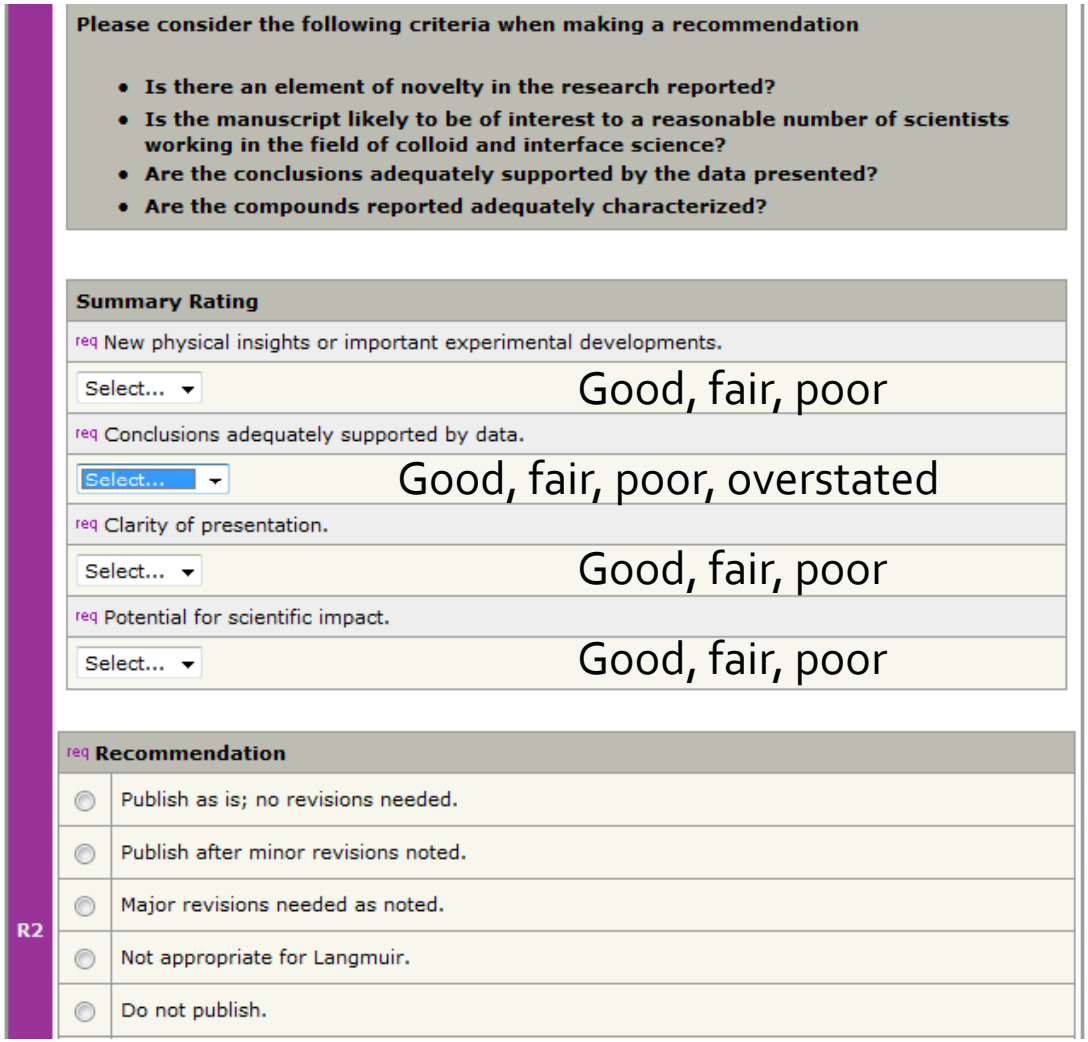
Critiquing Papers

- **Results**
  - Do the results tell a story? → organization
    - Usually synthesis → physical characterization →application performance
  - Has appropriate error analysis been conducted on the data?
    - Appropriate number of replicates done (usually n=4 at least)
    - Proper statistical analysis done to compare values (t-tests, F-tests, etc.)
  - Appropriate number of results? (supplementary information)
  - Adequate data collected for characterizing the range of compositions, morphologies etc. proposed for use?
  - Do the graphs and statistical analysis actually show the trends highlighted?
    - Surprisingly common to see a disconnect between data and claims of what the data represents

Critiquing Papers

- **Discussion**
  - Do the results converge on common conclusions?
  - Are the trends observed consistent with theory?
  - Are explanations of results reasonable?
  - Have the results been contextualized relative to prior work?
    - May be partly done in introduction
  - Have the results been related to application reasonably?
    - No hyperbole in terms of what the results mean
- **Conclusion**
  - Conclusions backed by data, not wishful thinking

Critiquing Papers



Please consider the following criteria when making a recommendation

- **Is there an element of novelty in the research reported?**
- **Is the manuscript likely to be of interest to a reasonable number of scientists working in the field of colloid and interface science?**
- **Are the conclusions adequately supported by the data presented?**
- **Are the compounds reported adequately characterized?**

Summary Rating

req New physical insights or important experimental developments.

Select... — Good, fair, poor

req Conclusions adequately supported by data.

Select... — Good, fair, poor, overstated

req Clarity of presentation.

Select... — Good, fair, poor

req Potential for scientific impact.

Select... — Good, fair, poor

R2

req **Recommendation**

- Publish as is; no revisions needed.
- Publish after minor revisions noted.
- Major revisions needed as noted.
- Not appropriate for Langmuir.
- Do not publish.

- American Chemical Society reviewer form
- Treat papers as if it is up to you to decide whether or not they are good enough for publication