

Thoughts on the Intellectual Development of Researchers

A first year graduate student

- 1) Can explain the motivation of their research (both why it was funded, and how it fits the broader goals of the research group).
- 2) Asks relevant questions about the relationship between their research and current literature
- 3) Proposes reasonable ideas for small research projects (1-6 months duration)
- 4) Is sufficiently familiar with recent group papers and other critical papers related to their research topic to explain their importance and method
- 5) Is familiar with basic information in the broader field of their research (e.g, atmospheric chemistry)
- 6) Can explain the reason for most details of their experimental setup and procedures

Second year graduate student also:

- 1) Can explain the reasons for all details of their experimental setup and procedures
- 2) Proposes improvements in current method/apparatus
- 3) Asks critical questions about the method, interpretation, motivations, and importance of current papers related to their research topic (e.g., kinetics, alkoxy radical chemistry)
- 4) Proposes reasonable ideas for short-range research projects (6-12 months duration)
- 5) On their own, reads papers and books in the broader field of their research
- 6) Reads current papers (and books) related to their research topic, presents papers in group meetings

A Third year graduate student also:

- 1) Proposes reasonable ideas for fundable research projects (2-3 years duration), including ones that lead in very different directions than current research in their group
- 2) Is more familiar with the current literature (last 2 years) that is relevant to their project than their research advisor
- 3) Critically assesses the method, interpretation, motivations, and importance of current papers related to their research topic
- 4) Asks critical questions about the motivations/importance of current papers in the broader field of their research
- 5) Is able to draft a paper, poster, or talk describing their research results.

We expect that a fourth year graduate student also:

- 1) Asks critical questions about the method and interpretation of current papers in the broader field of their research

Note that the words “Proposes,” “Asks,” and “Critically assesses” at the beginning of some of these items refer to things researchers take the initiative to do, rather than things they do only when asked.