Chemistry 4000/5000/7000: Organometallic Chemistry
Fall 2021

Research Program Outline & Budget – Guidelines and Expectations

Value: 5% of final grade

- All documents must be submitted both electronically and in hard copy.
- Spelling, grammar and overall presentation are important and marks will be given or deducted accordingly.

Due: Wednesday, October 13, 2021

Background:

- You are applying to a job opening for a faculty position in the Department of Chemistry and Biochemistry at the University of Lethbridge. Your area of specialization is Organometallic Chemistry. You must outline the research program you will develop if hired. This program must consist of at least 2 *separate* research projects.

Research Program Outline:

- Page Limit: 1 page
- Be sure to briefly describe:
    - the objectives: both short and long term;
    - anticipated significance of the work; and
    - training to take place through the proposal (if none, explain why).

Budget:

- Page Limit: 2 pages
- How much money will you realistically require to perform the research (per year)?
- Assume that you have access to all major facilities currently available at the University of Lethbridge (*e.g.* NMR, EPR, mass spectrometry, X-ray crystallography, elemental analysis, etc.) If you need additional specialized equipment how much will it cost?
- How many people do you plan to employ? What level of experience will you be seeking (undergraduate or graduate student(s), post-doctoral fellow(s), permanent or semi-permanent research assistant)? How much will their annualized salary be?
- Will you need to pay fees for the use of equipment or a facility?
- Will you need travel money (*e.g.* conferences)?
- Explain any ongoing consumable costs (*e.g.* solvents, pipettes, scientific gases, etc.) and estimate how much money you will require to cover such expenses.
- Justify all expenditures – remember these funds are coming from the government and you will be spending tax-payer dollars. If you do not make a sufficient case for your need of the funds, you may not get the job.

Research Proposal – Guidelines and Expectations

Value: 20% of final grade (15% for Graduate Students)

- All documents must be submitted both electronically and in hard copy.
- Spelling, grammar and overall presentation are important and marks will be given or deducted accordingly.

Due: Monday, November 15, 2021

Background:

- You have just been hired at the University of Lethbridge as a new faculty member in the Department of Chemistry and Biochemistry. Your area of specialization is Organometallic Chemistry. You must now apply to the Natural Sciences and Engineering Research Council of Canada (NSERC) for research funds (Discovery Grant). This is a very competitive process which necessitates that you clearly rationalize why your proposed research is important. Why should NSERC fund your research program?

Proposed Research:

- Page Limit: 5 pages (including figures)
- The title will be used for publication purposes. It should describe the subject of the research to be supported. It should not contain a company or trade name. Spell out scientific symbols and acronyms.
- Use the headings below to describe the research to be supported. Provide details on:
    - objectives: both short and long term;
    - literature pertinent to the proposal;
    - methods and proposed approach;
    - anticipated significance of the work; and
    - training to take place through the proposal (if none, explain why).
- Discuss relevant background information. What has been done in this area? Use this as a chance to point out why someone might be interested in funding the research area, but also, illustrate what has not been examined and what exciting new directions remain to be explored. Put your proposed research in prospective.
- What will you attempt to answer? Why would anyone be interested? Why should anyone give you money (*e.g.* fundamental interest and expansion of new knowledge, or perhaps more applied reasons (immediately tangible benefits by tackling a current problem or question))?
- How will you attempt to answer your given question(s)? What instruments/equipment will you use (glove box, elemental analyzer, mass spectrum, NMR, etc.)? If the University of Lethbridge does not have these facilities, where and how will you gain access to them?
- Include a rough timeline for how long the given project will take.
- How will this project aid in the training of highly qualified personnel (HQP)?
- The use of figures is highly encouraged as they are often invaluable when describing complex topics.

- ***GENERAL PRESENTATION GUIDELINES***
  - Print must be in black ink and of letter quality.
  - Text must be single-spaced, with no more than six lines per inch.
  - The accepted font is Times New Roman regular 12 pts, or any comparable font – nothing smaller.
  - Condensed font, and applications completed strictly in italics, are not acceptable.
  - Use white paper, 8 1/2 x 11 inches (21.5 cm x 28 cm), portrait format, with a single column.
  - Set margins at 3/4 of an inch (1.9 cm) (minimum) all around.
  - Enter your name at the top of every page, outside the set margins.
  - Print on one side of the page only.
  - **Note:** All text, including references, must conform to these standards. Incomplete applications and/or applications that do not meet the presentation standards may be rejected or be at a disadvantage in comparison with those that are complete and respect the presentation standards.
  - Avoid using acronyms and abbreviations or explain them fully.

Keywords:

- List a maximum of 10 words or phrases that best describe your research proposal.

General Language Summary:

- Page Limit: 0.5 pages
- The summary is intended to explain the proposal in language that the public can understand and will be used for publication purposes (newspapers, television, etc.). Using simple terms, briefly describe the nature of the work to be done. Indicate why and to whom the research is important, the anticipated outcomes, and how your field and Canada will benefit. If you wish, you may also provide a summary in the second official language.

References:

- Page Limit: 1 page
- Use this section to provide a list of literature references.
- Do **not** refer readers to Web sites for additional information on your proposal.
- Do **not** introduce hyperlinks in your list of references.
- Use the format established by the *Journal of the American Chemical Society* (*J. Am. Chem. Soc.*) For additional information see:. http://pubs.acs.org/page/jacsat/submission/authors.html

Suggested Reviewers:

- Your proposal will be sent to 2 experts in the field for their professional opinion on whether or not your program should be funded. List the names, affiliated universities and mailing addresses of 5 such qualified individuals. These researchers should be active in the general area you are proposing to do new research.

Reviewing:

- Value: 20% of the grade allocated to the research proposal.
- You will receive 2 anonymous proposals to review on Wednesday, November 17. You will have 12 days (due Monday, November 29) to critique these proposals.
- Page Limit: 1 page
- In providing comments, please consider the following questions and be as specific as possible:
    - Has the proposal scientific flaws which should prohibit its funding? If so, please provide details.
    - How well written is the proposal? Does it follow an appropriate flow?
    - Have all NSERC guidelines been followed?
    - Is the proposed work original?
    - Does the proposal reference previous literature appropriately?
    - Does the proposal properly describe HQP opportunities?
    - Do you recommend funding of this proposal?

Possible Topics/Research Areas:

- Catalytic CO_2 Activation (Joseph Sadighi, Karsten Meyer, Carol Burns)
- C–H bond Activation (John Bercaw, Karen Goldberg, Alex Goldman, John Hartwig, David Milstein)
- Organometallic Electrochemistry (Bill Geiger)
- Extended Organometallic Arrays/Materials (J. Fraser Stoddart, Dwight Sweigert, George Shimizu, Omar Yaghi)
- N_2 Activation/N_2 Fixation (Mike Fryzuk, Christopher Cummins, Jonas Peters)
- Metal Carbides (Christopher Cummins)
- Olefin Metathesis (Robert Grubbs, Richard Schrock, Amir Hoveyda, Warren Piers)
- Metal–Metal Bonds (esp. quintuple bonds) (Philip Power, F. Albert Cotton)
- Catalytic Hydroamination (Tobin Marks, Laurel Schafer, John Hartwig)
- Frustrated Lewis Pairs (Douglas Stephan, Gerard Erker, Warren Piers)
- Bioorganometallics (Gerard Erker, Chris Pickett, Neil Burford, Chris Orvig)
- Asymmetric Synthesis or Catalysis (Antonio Togni, Barry Trost, Greg Fu, Mark Stradiotto)
- M=E multiple bonding (E = N, P, Si, O, etc.) (T. Don Tilley, Hiaski Hashimoto, Robert Bergman, Greg Hillhouse, Yaofeng Chen)
- Organolanthanide or Actinide Chemistry (Tobin Marks, Karsten Meyer, Polly Arnold, Carol Burns, Jacqueline Kiplinger, Richard Andersen, David Berg, David Emslie)
- Computational Organometallic Chemistry (Tom Ziegler, Tom Woo, Michael Hall)
- Any area which you get approved by me

Graduate Student Presentation:

- The presentation will be ~30 minutes in length (including ~5 minutes for questions) and take place during the last week of classes (December 1st and 6th).
- PowerPoint should be used for the presentation.
- An electronic copy of the presentation must be submitted.
- Approximately half of the presentation should focus upon relevant background information. *This material will be eligible for the final examination.*