Training course on Scientific Research Proposal Writing

Session two + Exercises

Partly based on

Univ. Connecticut Writing Center Science Liaison

Reinhart Ceulemans

University of Antwerp, Belgium

September 2015

Writing a Scientific Research Proposal

A research proposal has three main points:

1. Explanation of proposed research : ***what will be done?***
2. Methods and techniques to be employed : ***how will it be done?***
3. Novelty and/or importance of the study : ***why should it be done?***

1. Title

- Should provide a specific summary of the proposed research
- A title may be more important than you think

Example 1:

"Habitat models for use in rivers"

NO (not enough detail)

"Validation of in-stream habitat models for the Svratka River, Moravia"

YES

1. Title

Example 2:

"A three-year study of population decline in the spotted salamander (*Ambystoma maculata)* following logging, road building and wetland mitigation near vernal pools in a floodplain forest of northeastern Moravia"

NOT good (too much detail)

✓"A study of population decline in the spotted salamander (*Ambystoma maculata)* following logging in a floodplain forest".

✓ "A study of population decline in the spotted salamander following logging in a floodplain forest in Moravia"

YES

Practical work

- Write a good title for your project proposal
- Maximum length 20 words
- 15 min

Scoring

- 5: Maximum score. Excellent, perfect.
- 4: Very good & very convincing, but can be slightly improved.
- 3: Good, but can be significantly improved.
- 2: Acceptable, but not really good
- 1: Bad, barely acceptable
- 0: Rubbish, not even consider, not even read any further.

11. Abstract

- One paragraph (no indent)
- Abstract = Summary that guides the reader
- A brief description of the hypothesis and the goals of the experiment / proposal.
- Should indicate what questions you, as a researcher, will be seeking to answer in the proposal.
- Provides a summary that allows the reader / evaluator to quickly assess the basic premise of your proposal.
- Write this as a separate text (do not copy and paste sections of your proposal).

Practical work

- Write the Abstract of a research proposal

- Max. 300 words or 2000 characters (with spaces)
- 45 min

III. Introduction, incl. Literature

- You should begin with the (general) basics of your research topic and then narrow the focus of those details that are especially pertinent to the proposed work / research.
- Present what is currently known by forest biologists (e.g.), and how these discoveries were made. This is the place to show what is interesting and cutting-edge in the field that led to your research idea.
- You are laying the groundwork for your proposal with the material that you present.

III. Introduction

- Identify and describe the conceptual framework for your research question.
- Review the relevant theoretical and empirical literature both for the (your) system being studied and for related systems.

Literature in your Proposal

- Briefly review only most relevant literature.
- Use the appropriate sources, especially primary sources such as journal articles.
- Textbooks, web sites (with great caution!) and personal communications with professors can be useful sources (caution!)
- Make sure to cite appropriately in the text (more to follow on citation).
- Not an overload on references.
- Try to list the references in an abbreviated format (in small lettersize; with numbers; as footnotes; …..)

Literature in your Proposal

Your sentence structure should look something like this:

1. Within organisms cellular nitrogen generally exists as either ammonia-nitrogen or amino-nitrogen, which are the most reduced forms of nitrogen (Delwiche, 1981).
2. According to Thullen *et al.* (1999) nitrate removal rates were highest in those wetlands that contained a divers number of plant species.

Literature in your Proposal

- Never leave your reader in doubt as to the source of your information.
- Cite thoroughly and cite properly.
- Citations tend to be **(author, year)**. If you refer to the author in the sentence, immediately follow the name with **(year) (**see examples above).

Note on sources, paraphrasing & citations

- Unlike the style you might use in English expository writing, technical science writing is dry, clear cut, and lacking in artistic enhancements.

- When using information from a source avoid quoting directly. Read the piece, put the article down, and then put the important points into your own words.

- By setting the article aside you are allowing yourself to process the information, instead of just spitting the idea back out in a slightly altered sentence.

IV. Research Hypothesis

- This is the heart of your proposal, but it does not have to be lengthiest piece of it.

- What is the hypothesis that you are testing?
- What are the questions that you seek to answer?
- Based on what is known in this (your) field, explain what do you expect to see and hope to show through the outcome (= the results) of your project?
- This is where you share your thoughts.

Research hypothesis should result from your Introduction

- Articulate the general research question in the context of the conceptual framework and the theoretical and empirical work that precedes the proposed work
- Formulate a (set of) hypothese(s) to address your general question.

Research hypothesis should ask the right question

- The best proposals are built from the best science. Effective (successful) proposals require a sound scientific basis. Articulating and developing a logical framework for the problem are the key elements in the success and power of the research.
- Therefore, the time spent developing your ideas is well spent. Some researchers believe that the best problem solvers are individuals who understand the need to get the initial question right (Runco 1994).

Develop your conceptual framework

- Conceptualizing your research is the most substantial step in preparing and writing a proposal.
- Some people work on their ideas for months or years before they actually begin to write.
- Others, especially students, pull together their ideas only when they are required to write their first research proposal.

Practical work

- Write out a (your) research hypothesis, or the main objectives of your research proposal
- 30 min

V. Material and Methods: How?

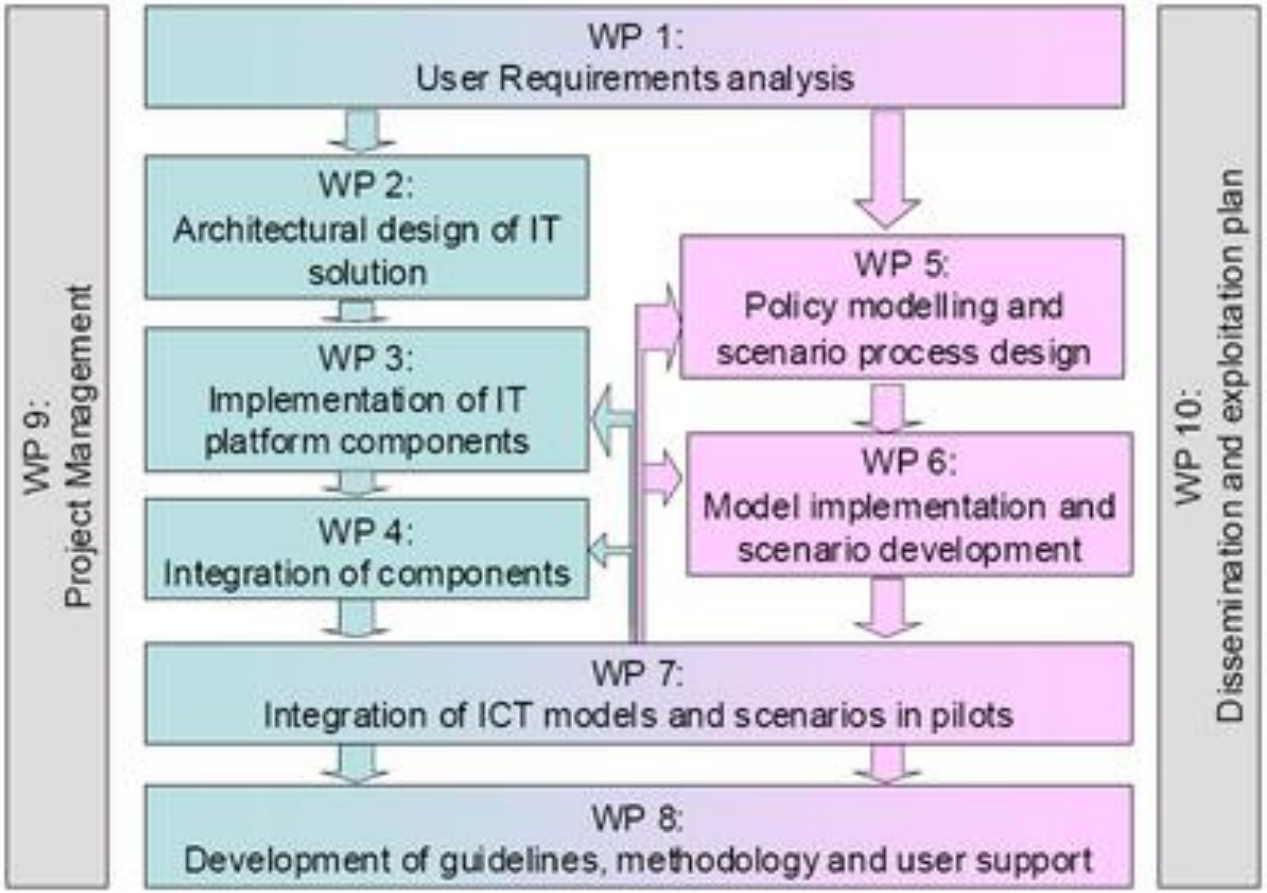
- Describe your proposed experiment(s) in depth.
- What processes are you going to use?
- What kind of equipment and supplies will be necessary for the project?
- What will you use for a control, and what will be your replicate(s)? Think already about statistical analysis!
- Be thorough, but not excessive. It might be useful to construct an outline before completing this section, as this will give you an idea of what should be occurring when, and if your goals are attainable in the given time.

Methodology: How?

- Design studies to test (each) hypothesis.
- Develop methods and techniques to test, to analyze and to synthesize results.

- Evaluate potential alternative outcomes that may be obtained from each part of your proposed study, and consider where each of these alternatives may lead.

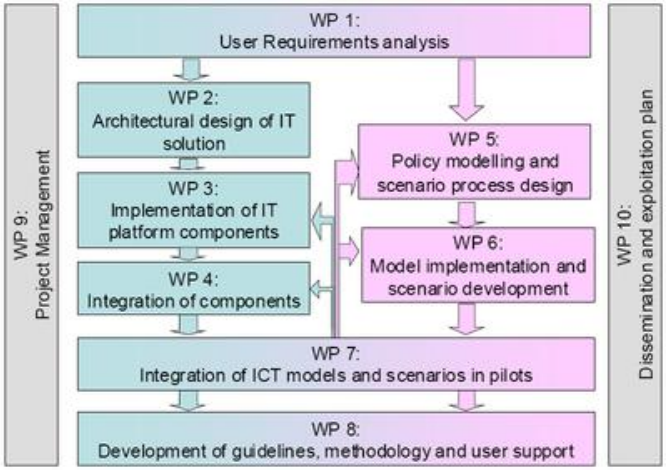
Create work packages



Milestone

Deliverable

Work package



Deliverables? Milestones?

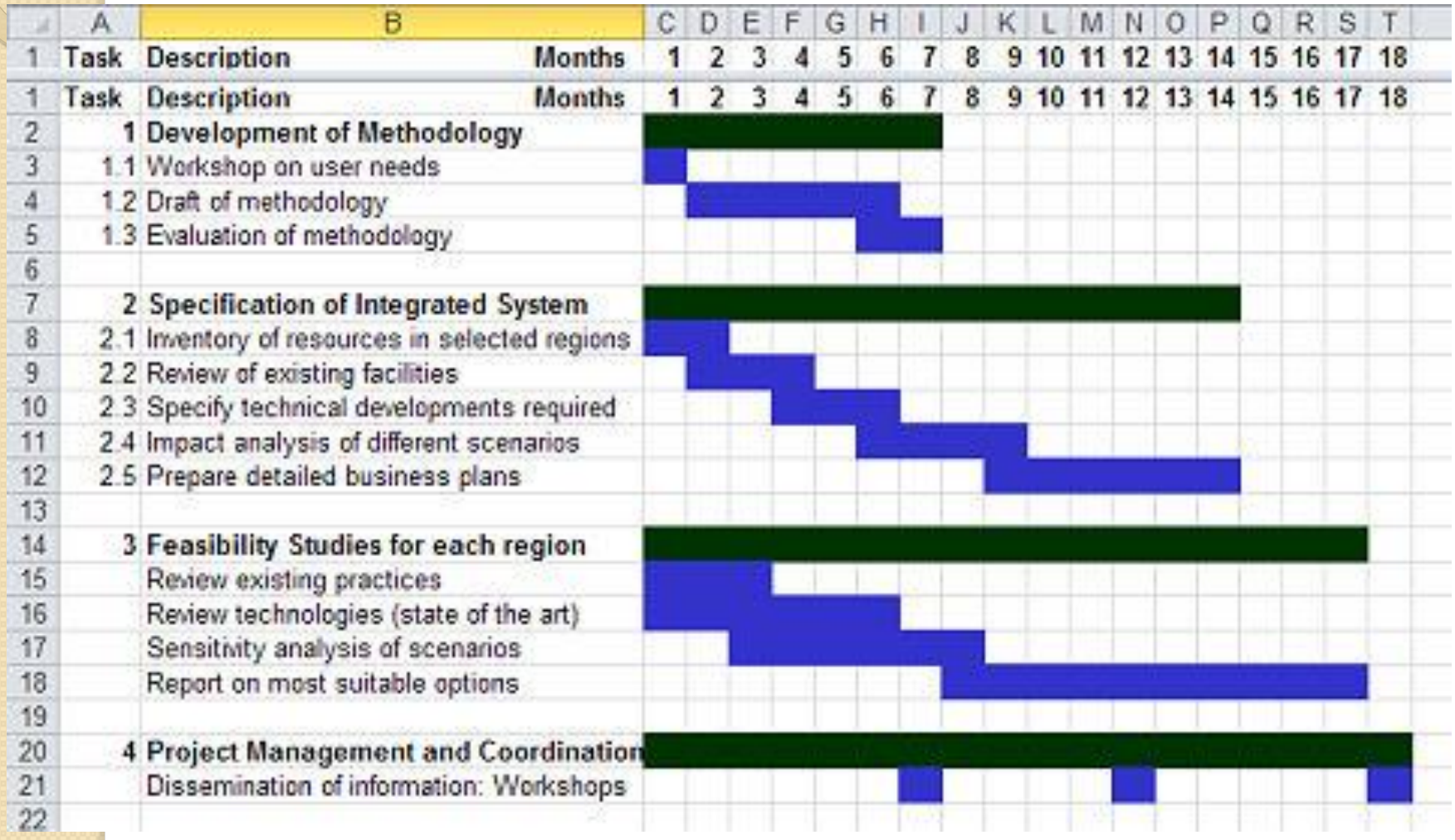
- Work packages: cut up your work / research / project in 'digestible' parts

- Deliverable: something you provide, you give, you deliver. As a deliverable you can indicate e.g. a scientific publication on a specific topic (e.g. in work package 3).

- Milestone = a go/no go critical point in your research. After this achievement a new phase of research can start. Mostly there is no milestone (go/no go moment) in the first part of your project due to the high risk. Generally, only a limited number of milestones (3-4) are defined for a project, but more deliverables.
- No milestone should be defined for a technical decision (yes or no) to repeat/complete measurements, but milestones should be driven by a scientific achievement (content related) which allows you to go to the next step.

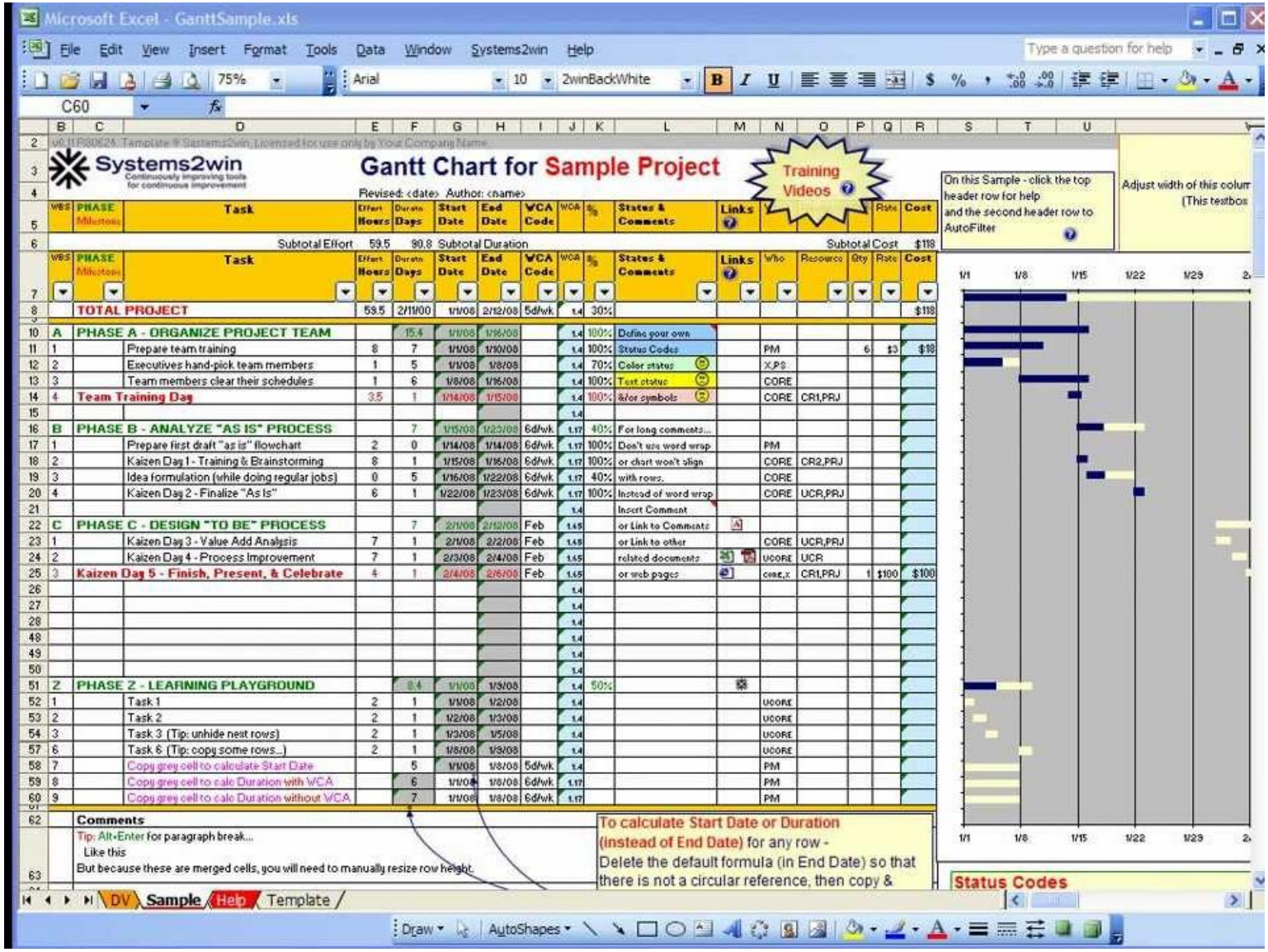
- *Examples.*
- Deliverable1.1: 50 samples harvested; Deliverable 1.2: Publication on enzyme analysis submitted.
- Milestone 1: Understanding of the photosynthesis damage process; Milestone 2: Successful test of new extraction method.

Combine work packages, deliverables & milestones in Gantt scheme



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	Task	Description Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	Task	Description Months	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
2	1	**Development of Methodology**																		
3	1.1	Workshop on user needs																		
4	1.2	Draft of methodology																		
5	1.3	Evaluation of methodology																		
6																				
7	2	**Specification of Integrated System**																		
8	2.1	Inventory of resources in selected regions																		
9	2.2	Review of existing facilities																		
10	2.3	Specify technical developments required																		
11	2.4	Impact analysis of different scenarios																		
12	2.5	Prepare detailed business plans																		
13																				
14	3	**Feasibility Studies for each region**																		
15		Review existing practices																		
16		Review technologies (state of the art)																		
17		Sensitivity analysis of scenarios																		
18		Report on most suitable options																		
19																				
20	4	**Project Management and Coordination**																		
21		Dissemination of information: Workshops																		
22																				

Practical work: prepare Gantt scheme



VI. Conclusion and Justification: Why?

- Your literature (review) will have already helped to lead the reader to an understanding of why your topic is of importance.
- This is where you will explicitly state how your proposed research will advance knowledge.
- What are the far-reaching effects?
- Will your study potentially change practices or policies?
- Why is it that your research deserves funding?

VII. Bibliography

- Include all the sources that were used in the writing of your proposal. If you have the space, the references can have the format / style of a scientific journal.
- Example: Caspar T, Huber SC and Somerville C (1985) Alternation in growth, photosynthesis, and respiration in a starchless mutant of *Arabidopsis thaliana* deficient in chloroplast phospho-glucomutase activity. *Plant Physiol.* 79: 11-17.

- If you don't have the space, use a shorter, abbreviated format (in small lettersize, with numbers, as footnotes,…..)
- Example: Casper, Huber & Somerville, 1985, Plant Physiol. 79: 11-17.

A note on voice

- There is no one format for voice in project writing or scientific writing.
- The active voice is usually encouraged : use of "I" or "We".
- If you write a proposal for a personal fellowship / grant, use "I".
- Several writers switch between active and passive voice to keep the writing from becoming too repetitive….. In scientific papers, this is not a good idea. In project proposals, this might work.

Accomplish administrative tasks

- Begin by reading the proposal guidelines and requirements for the potential funding agency or foundation, or the guidelines issued by your department.
- Think about optimal lengths for each section. This activity will probably put you at ease because you will quickly realize that most grant applications are usually concise (15 pp. for example).

Accomplish administrative tasks

- Another important task is determining an institution's procedures for grant processing.
- Ask questions such as: "What paperwork must I complete?" "What signatures do I need?" "Where can I ask help?" "What are the institution's rules on budgets, overhead costs, and cost sharing?"
- "Do I need special permission for anything?" (e.g., animal care, use of human subjects).

Important Points to Remember

- An organized, well-written, concise, complete proposal = an easier to conduct experiment.
- A good proposal is like a good sales pitch. In the world of graduate studies and scientific research a proposal is the means by which funding is secured.
- Good project writing when paired with a thorough understanding of the subject matter is a valuable skill to possess.

General suggestions

1. THINK BIG (but be realistic). Reflect on your problem from its broadest perspective. Imagine finding innovative solutions to fundamentally important problems. If you start small, your work will end up even smaller.

2. AVOID TUNNEL VISION. Consider projects that could lead to years of research. Enjoy a time of intense creativity, and – at least for a while – think beyond your immediate research area.

General suggestions

3. DREAM (but stay realistic). Dream about solving important problems, making a difference, producing significant papers, even winning a Nobel Prize.

4. TAKE YOUR TIME. Great ideas do not appear in 30-minute windows of time. When designing a research project, expect to spend lots of time on it. You will….

Practical tasks

1. Find at least one set of proposal guidelines
2. Critique other proposals
3. Accomplish administrative and technical tasks
4. Prepare your own C.V.
5. Work on the conceptual framework of your research

Critique other proposals

- As you read proposals, consider the following major criteria: scientific content, innovation and scope of ideas and methods, structure and format, clarity, and style.
- Also consider the following while evaluating a proposal: scientific importance of the question(s), rigor of hypotheses, feasibility of research design, qualifications of the investigator, and suitability of facilities for the proposed work.

Critique other proposals

Using the title, the project summary (or abstract), and the significance sections, we question whether the author of the project proposal has convincingly justified the proposed work. We discuss methods, graphics, and style and ask whether the work captured our attention.