Logical flow (a very simple) example

**BUDGET**

*Funds to map individual intrusions in pluton X*

**METHODS**

*Mapping individual intrusions will allow us to constrain the number and volume of melt pulses*

**HYPOTHESES**

1) *Plutons can be constructed by many small melt pulses, or*
2) *a small number of very large pulses*

**PROBLEM/QUESTION**

*How are plutons/magma chambers constructed?*
For UAF Undergraduates

URSA- Undergraduate Research and Scholarly Activity

UAF undergraduate students are invited to apply for one of ten URSA 2015 Spring Project Awards of $2500 to fund student salary, travel, services, tuition and/or supplies. Projects in any UAF discipline will be considered.

Deadline: February 26, 2016

Spring 2016 Request for Proposals (RFP) and proposal format
URSA Award Schedule
Funded examples:
M. Vanagel: Synthesis, purification and molecular recognition with helical molecules
R. Witte: Tellurium speciation and partitioning during Au-Ag extraction,
M. Vanagel: Optimization of the CLARITY technique for implementation in UAF research
D. Knight: Bioaccessibility of metals in Alaska road dust.
D. Emery: Geographic variability of Active Ingredients in Spice within Alaska as an indicator of Distribution Mechanisms,
what you aspects of the proposal you would like to mimic?

as well as any questions you might have about how certain aspects are developed.
Fall 2016 projects
Open April 1
Due April 29, 2016

http://www.uaf.edu/ursa/
What’s in an RFP?

1. What kind of projects they fund
2. Who is eligible to apply
3. Application format requirements
4. Review criteria
5. Deadlines for submission and notification
6. Contact info

RFP length
- URSA- 1 pg
- GCG- 9 pgs
- NSF- 80 pgs
Personal Information

Title

Abstract (200 words max)

1. Goals (200 words max)
2. Background and Significance (300 words max)
3. Design and Methodology (300 words max)
4. Anticipated Outcomes (300 words max)
5. Mentoring Plan (200 words max)
6. Budget
What is the title of your proposal?

1 min to write it down
2 min to share and revise
Ancillary proposal components

- Proposal
- Goals
- Anticipated Outcomes
- Mentoring Plan
- Budget
- Timeline
- Figure
- Letters of Recommendation
Goals (200 words max) - Provide a concise listing of your project objectives, creative purpose or research hypothesis.

Overarching goal - larger than the project you are proposing
Specific aims - SMART tasks

Clearly and explicitly state problem and specific objectives
Don’t leave it to the reviewer to connect these dots.
**Goals (200 words max)** - Provide a concise listing of your project objectives, creative purpose or research hypothesis.

**Recipe:**

2 sentences: Why is the research area important?

1 sentence: What is the overarching goal?

This goal will be addressed by a number of specific aims:

1. Specific aim 1
2. Specific aim 2...

1 sentence on the approach used to accomplish the goals

1 sentence on the implications of accomplishing the goals related to the overarching goal
Goals

The overarching goal of this project is to optimize Te recovery from Au-Ag mining operations to help secure the Te supply required for production and large-scale deployment of photovoltaics. Currently, more than 90% of the global Te supply is obtained as a byproduct of Cu mining operations, but industry demands are outstripping production, resulting in dramatic price increases (USGS, 2013). While there is potential for large quantities of Te to be recovered from Au-Ag mining processes, this has historically not been economically viable. However, recent focus on Te as an energy critical element and large increases in price warrants reevaluation of the economics of Te recovery. This project seeks to assess the potential for Te recovery through examination of Te behavior during extraction. Specifically, the project will:

1. Determine elemental composition of samples from stages in the extraction process at Golden Sunlight.
2. Perform mass balance calculation for Te using elemental concentration and flux data, identifying potential points for Te extraction.
3. Analyze spatial collocations of Te and other metal(loid)s Fe, Cu, S, Au, and Bi to determine Te-bearing mineral phases.

Results of this study will be presented at the 2014 UAF Research Day, 24th Fairbanks Biennial Alaska’s Miners Conference, and form the basis for a peer-reviewed publication.
Overarching goal and specific aims

What is the overarching goal of your research?

What are the 2-3 specific aims of your proposal?

2 min to write it down
5 min to share and revise
Goals (200 words max)
Provide a concise listing of your project objectives, creative purpose or research hypothesis.

Background and Significance (300 words max)
Provide a brief background to describe the rationale and significance of the proposed project. If appropriate, use supporting literature, i.e.; primary literature for research projects.

Design and Methodology (300 words max)
Summarize the design of the project and describe the methods, procedures and/or protocols planned to achieve the goals. Describe any equipment or facilities that will be used. Provide a timeline of the project work.
Put your project in a broad context

• Clearly state the significance of the topic
• Demonstrate that you have done your homework; citing relevant publications
• You don’t need to solve the entire problem, but demonstrate that you are aware of it
• Help the reviewer understand how the proposed work fits into the larger context
Research Plan

Concisely state your research plan and how it will test your hypothesis stated above.

Get concrete, what will you do?

Is problem well constrained and feasible? Will you be able to collect the data you need

Are the techniques appropriate to questions asked and will they address the problem
Ancillary proposal components

- Mentoring Plan
- Budget
- Timeline
- Figure
- Letters of Recommendation
- Anticipated Outcomes
- Goals
- Proposal
Anticipated Outcomes (300 words max)
Describe the anticipated outcome(s): creative projects or research findings that will result from your project and student learning outcomes that will result from your participation in the project.

- Gains in scientific understanding of topic
- Concrete research projects
  - Poster or oral presentations
  - Reports or publications
- Translational products bringing your science to the public
  - CNSM newsletter, News Miner article, blog, educational tool, etc
- Related to career goals
Anticipated Outcomes (300 words max)
Describe the anticipated outcome(s): creative projects or research findings that will result from your project and student learning outcomes that will result from your participation in the project.

**Recipe:**
1-2 sentences about your educational goals and the relevance of this research in reaching them
1 sentence describing how your research will result in a variety of research products
List of research products
Anticipated Outcome(s)

I anticipate that this project will result both in a qualitative understanding of Te partitioning throughout the mining process at the Golden Sunlight Mine, quantitative results about Te concentration in each of the samples, and conclusions about the collocation of Te and other elements. Once these results are achieved, the next stage of the project will be communicating these results to the scientific and mining communities. To accomplish this, I will:

1. Present results at UAF Research Day on April 29, 2014
2. Present results at the Alaska Miner’s Association 24th Biennial Conference in Fairbanks, April 7-13, 2014
3. Submit written report to Barrick Gold/Golden Sunlight Mine detailing results and recommendations

It is further anticipated that the results of this project will be used as supporting data in an eventual peer-reviewed publication. Working towards co-authorship of a scientific article is an anticipated outcome of this project. This project will be a career-building experience for me as a chemist and researcher, fostering my enthusiasm for chemistry and allowing me to explore exciting new possibilities for instrumental analysis and scientific collaboration.
Ancillary proposal components

Proposal

- Mentoring Plan
- Budget
- Timeline
- Figure
- Anticipated Outcomes
- Goals
- Letters of Recommendation
Mentoring Plan (200 words max)
Describe the faculty mentor’s role and/or participation in the project. Include a schedule of mentorship (frequency and objectives of meetings between student and mentor).

Write this section with your mentor!
You need to agree on the assistance they will provide you.
- Individual meetings
- Lab group meetings
- Are you enrolled in a research course?
- When will you be in lab each week?
- Where will you be working?
Ancillary proposal components

- Proposal
- Goals
- Anticipated Outcomes
- Mentoring Plan
- Budget
- Timeline
- Figure
- Letters of Recommendation
Budget and Justification

Each budget item you request will need to be:

• Explicitly tied to the research you outline in the proposal

• Reflect accurate prices for the services and commodities you need, and to sum properly.

• Listed in Budget Justification

In the budget justification, you need to justify how you know how much things cost.

Not why it is required for your project *unless it is unusual*
What can you request money for?

• CHEM 488 tuition
• Hourly stipend
• Instrument costs
• Poster printing
• Travel costs
• Reagents and lab consumables
• Specialized equipment
**Example: Collect data at Stanford’s SHRIMP lab**

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flight</td>
<td>$817</td>
</tr>
<tr>
<td>Ride share</td>
<td>2 @ $30</td>
</tr>
<tr>
<td></td>
<td>$60</td>
</tr>
<tr>
<td>Lodging</td>
<td>7 @ $137</td>
</tr>
<tr>
<td></td>
<td>$959</td>
</tr>
<tr>
<td>Per Diem</td>
<td>8 @$59</td>
</tr>
<tr>
<td></td>
<td>$472</td>
</tr>
<tr>
<td>Lab supplies and hourly use fee</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$2,458</strong></td>
</tr>
</tbody>
</table>

**Justification:** 7 days instrument time scheduled February 3-10, 2014

Alaska Airlines FAI ➔ SFO ➔ FAI (only carrier servicing FAI, priced 10-20-2014)

Eco-lodge ($137 per night) cheapest option available within walking distance of SHRIMP and several restaurants, meaning no rental car is necessary.

**SHRIMP lab** requires users purchase their own epoxy for mounting grains ($30) and use of heavy liquid separation lab (~4 hrs @ $30/ hr).
Other Justifications

Hertz Rental Car: 9 days at $89. Pickup with 4WD is required to carry field equipment and reach remote mountain field sites.

Gas: 357 miles Denver to Gunnison (357 x 2), 50 miles per day to field site (50 x 8).  1,114 miles x gal/18 mi x $4.15/ gal = $257

Samples must remain frozen prior to analysis, requiring storage in dry ice (30 lbs @ $5.00/lb) and overnight shipping (3 coolers at $45 ea).

WD-XRF 12 samples @ $16 at Activation laboratories

Shipping to Activation laboratories via Fed-Ex $35

Arizona Laboratory for Emerging Contaminants: 55 element ICP-MS 12 samples @ $37

Acme labs: Radiogenic nuclides 12 samples @ $150
Ancillary proposal components

- Proposal
- Goals
- Anticipated Outcomes
- Mentoring Plan
- Budget
- Timeline
- Figure
- Letters of Recommendation
**Timeline**

**How quickly will you be able to progress through your project?**

<table>
<thead>
<tr>
<th>Week</th>
<th>Dates</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-10</td>
<td>June 30th - September 7th</td>
<td>Sample acquisition</td>
</tr>
<tr>
<td>11-12</td>
<td>September 8th - September 21st</td>
<td>Literature review and Techniques with standards</td>
</tr>
<tr>
<td>13</td>
<td>September 22st - September 28th</td>
<td>Extraction on samples, sample prep for HPLC</td>
</tr>
<tr>
<td>14-16</td>
<td>September 29th - October 19th</td>
<td>Sample Testing on HPLC-MS</td>
</tr>
<tr>
<td>17</td>
<td>October 20th - October 26th</td>
<td>Sample Prep for GC-MS</td>
</tr>
<tr>
<td>18-19</td>
<td>October 27th - November 9th</td>
<td>Run GC-MS samples</td>
</tr>
<tr>
<td>20-22</td>
<td>November 10th - November 30th</td>
<td>Mass Spectra analysis and interpretation</td>
</tr>
<tr>
<td>23-25</td>
<td>December 1st - December 21st</td>
<td>Mass spectra interpretation and poster development</td>
</tr>
</tbody>
</table>

Example from D. Emery
Gantt Chart

An excellent way to communicate a project plan.

http://www.advsofteng.com/images/colorgantt.png
Ancillary proposal components

Proposition

- Goals
- Anticipated Outcomes
- Mentoring Plan
- Budget
- Timeline
- Figure
- Letters of Recommendation
What kind of figure is most effective?

1. What is the purpose of your figure?
   - Help explain some complexity - save text
   - Conceptual model you’re testing
   - Illustrate hypothesis
   - Highlight impact of your research
   - Place field site in context
   - Showcase results and conclusions
   - Show a complex experimental setup or workflow

2. What components might be included in your figure?
   - Pictures
   - Maps
   - Schematics
   - Flow chart
   - Conceptual model

Your figure can (and should?) have multiple parts
A good figure helps explain your research question.

3. Building and refine your figure
   Title- orient your audience
   Caption- describe what is shown
   Images- cartoons, pictures, schematics, maps, etc

4. The devil is always in the details
   Legend, scale bars
   Annotate figure to highlight key elements
   All text large enough to read easily
   Visually appealing
   Use colors to make understanding intuitive
   Clutter minimized
   Write a strong caption!
   Add citations when appropriate

Integrate your figure into the text by referencing it (multiple times)!
A good figure can strengthen proposals and illustrate complex relationships.
**Conceptual model**

**Geochemistry of Te**

- Develop formation models to guide exploration
- Examine formation mode of high grade alkaline Te deposits
- Examine Te liberation to optimize extraction
  - Determine Te distribution in host minerals
  - Assess optimal conditions for Te liberation using CN leach
- Explore Te speciation in weathering wastes as potential resources
  - Examine rates of primary Te-bearing mineral dissolution and formation of secondary phases
  - Determine the affect of geochemical conditions on Te weathering trajectory

**Supergene**

- Low P/T

**Hypogene**

- High P/T

---

**Figure 1. Project overview.** The goal of the proposed work is to examine the geochemistry of Te under supergene and hypogene conditions. Studies of the hypogene environment give insight into the formation of Te-bearing deposits, while understanding liberation of Te during extraction and oxidative weathering under earth surface conditions can point to increased extraction efficiency of current and historically mined Te resources.

Spry and Hayes
MEREP proposal 2011
Surficial tellurium geochemistry
Overview of N. Knight thesis work

Tellurium speciation in surficial weathering environment
Tellurium sequestration through sorption to soil minerals
Transport of Te-rich mine tailings
Bioaccessibility of Te-rich material

Fate of tellurium in a surficial environment

Hayes Mendenhall proposal 2009

N. Knight BLaST proposal 12-2014
Option 1: Heterogeneity between strains, indicates remote production

Option 2: Homogeneity within a shop, indicates in-house production

Option 3: Geographical variability with local homogeneity, indicates local production

D. Emery, URSA proposal
Site 2 mi Mine wastes

Streambed Contaminant transport

Environmental, animal, and human health

Riperian Corridor

National Wildlife Refuge

K. Milke BLaST proposal 12-2014
Peer mentoring

On-campus students
Alkalinity titration
Laboratory Analysis
(carbon, anions, cations)

Distance students
Water sampling, GPS, field probe
(temp, pH, DO, EC, etc)

Data Cycle
1. Students collect data & add data to Storyboard GIS.
2. TA synthesizes data to share with class & publication
3. Data archived on website

Hayes, Guerard, Iceman
BLaST proposal
12-2014
Ancillary proposal components

Proposal

- Mentoring Plan
- Budget
- Timeline
- Anticipated Outcomes
- Goals
- Figure
- Letters of Recommendation
Letters of Recommendation

Letters of recommendation and support

- From faculty
- From facilities you are using
- From companies you might be working with
- From gov partners
Getting good letters of support

1. Start early. Good letters take time!
2. Ask if the person can write you a STRONG letter before the deadline
3. Send letter writers supporting materials that will strengthen their letters
   - RFP, link to funding target, your materials, CV
4. Harass them mercilessly!
   - Call, email, stalk... whatever it takes!

Tip: Pull out the criteria for evaluation and tell them how you fit them and which aspects you would like them to highlight

YOU DO NOT NEED LETTERS FOR THE CLASS PROPOSAL
Components of a Project Plan

1. **Hypothesis** - what are you testing
2. **Approach** - How will you generally test your hypothesis?
3. **Methods** - How will you collect your samples and design your experiment?
   - How will you do the experiments?
   - How will you account for potential environmental or experimental error (controls!)
   - Field site description (if needed)
   - GET SPECIFIC!

4. **Anticipated Results** - Products of research
   - Conferences, presentations, publications, etc

5. **Timeline** - when will you be doing what?
6. **Budget and Justification** - what do you need to do the work?
   - Each item must be directly tied to work plan
   - Each item must be justified

7. **Required Scientific Facilities & Instrumentation**
Where are the problems?
(Science, Data, Writing)

The problem is poor or inadequate writing!

Little difference

Slide from: ars.usda.gov
What Causes the Problems

• Lack of clarity in project plan
• Lack of integration in the overall plan
• Lack of details in the experimental plan
• Lack of explanation of the role of project team members
• Lack of explanation of the knowledge gaps and how project will fill them
• Lack of confidence in the ability of the project team to accomplish the objectives

• Presentation of the information, not necessarily the scientific questions or the project team
• Can not see the logical path of science toward the goal
• Not an integrated plan but a collection of parts, plan looks and reads like it was assembled by a committee but not read for its “flow” once assembled.
Comments: “No Revision”

...studies will fill rather substantial knowledge gaps.

...well written and comprehensive

...well written project plan

...well organized, cogently prioritized and comprehensive research plan...

Slide from: ars.usda.gov
Comments: “Moderate Revision”

...one of the better written...

...excellent discussion of technology ...

...large research project plan but poorly organized.

...concerns that some of the objectives can be completed by this team.

...work and ability described as "adequate"

...missing current information

...hypotheses and plan well conceived, approaches appropriate

Slide from: ars.usda.gov
Comments: “Major Revision”

...a heroic course that...will not achieve the stated objectives

...serious flaws in experimental designs...

General Lack of focus. Plan is so broad that it leaves out important details...not clear data will be relevant or interpretable.

...lacks cohesion and clear direction

...writing style, quality, and organization significantly detract...

Short on details. Not well planned. Need to take process seriously.

Slide from: ars.usda.gov
Attributes of a Good (Great) Plan

- Explains the problem, the current state of knowledge, your expertise in the problem area, your approach to solving the problem, and the products from the research program
- Convinces the review panel that you are the best team to conduct this research.
- Presents your plan as a narrative from front to back
- Showcases your ability as a project team to conduct this research and solve a problem

By page 2 reviewers should know:
- The subject of your research
- Why it is important
- What it will produce
- How you are going to get there
Writing Quality

It is never too early to start writing!

“If I had more time I would write a shorter letter”

Samuel Clemens

• Don’t write in a vacuum. Seek out others to review your writing, especially your advisor(s).

• Write for the appropriate audience. In this case professional geologists who may not be in your field.

• Make sure you have addressed the question(s) asked in each section.
Be kind to the reviewer

Each reviewer reviews 50+ proposals

Keep in mind that your reviewers may not be specialists in your field.
• Avoid excessive jargon
• Minimize the number of acronyms you employ

Don’t leave it to the reviewer to connect these dots.
Looking Forward

Due CHEM 294: Notes on funded proposals
  Research project plan

Lab Today: Discussion with Dr. Hayes

Due CHEM 694: Project Plan feedback

Next Week (April 4)

Lecture- What is Science (John Harley, PhD cand.)
  Reading: The Art of Being a Scientist

Lab: Preliminary Experiments
Resources

- **Project Management and tools**
  
  [http://www.nextscientist.com/manage-a-large-research-project/](http://www.nextscientist.com/manage-a-large-research-project/)

- **Ebook specifically targeting undergraduate research**
  

- **Writing a project plan**
  
  Writing an Excellent Project Plan- [ars.Usda.gov](https://ars.usda.gov)
  Project Management Plan Template- [CDC- www2.cdc.gov](http://www2.cdc.gov)
Personal Information

Title

Abstract (200 words max)
Provide an introduction to your project including a description of what you are doing, why you are doing it and how you plan to conduct your project.

Goals (200 words max)
Provide a concise listing of your project objectives, creative purpose or research hypothesis.

Background and Significance (300 words max)
Provide a brief background to describe the rationale and significance of the proposed project. If appropriate, use supporting literature, i.e.; primary literature for research projects.

Design and Methodology (300 words max)
Summarize the design of the project and describe the methods, procedures and/or protocols planned to achieve the goals. Describe any equipment or facilities that will be used. Provide a timeline of the project work.

Anticipated Outcomes (300 words max)
Describe the anticipated outcome(s): creative projects or research findings that will result from your project and student learning outcomes that will result from your participation in the project.

Mentoring Plan (200 words max)
Describe the faculty mentor’s role and/or participation in the project. Include a schedule of mentorship (frequency and objectives of meetings between student and mentor).

Budget