Summary/Abstract

Most sponsors require an abstract or summary of some sort. The summary is used to provide an overview of the project in succinct clear terms. Sponsors use the summary to quickly determine if a project meets their needs. Sponsors may also use the summary for public relations.

The summary should be considered the public face of the project. Reviewers and funding managers will read the summary even if they do not read any other part of the proposal.

Important Notes about the Summary:

- **Write the summary last** – your proposal will likely change as you write, do not bother writing a summary that you will most certainly need to revise later.

- **Keep it brief, but clear** – A lay person reading your summary should be able to understand, in a basic way, what problem you plan to address and how.

- **Cover all the major project components** – use lists if you must but do not leave out any crucial points.

- **Include one intriguing component or “hook”** – it is important to catch the reader’s interest if you want them to read the whole proposal.

- **Mention everything the funder requires of the project** – summaries that do not address all proposer requirements may result in premature rejection of the proposal.

- **Follow the formatting guidelines** – Adhere to all formatting guidelines in letter and spirit.

Remember, the summary is the first (and possibly only) part of your proposal that the reviewers and program managers will read. Put your best foot forward.

Notes:

NSF Summary Page

The national Science Foundation has a particular form of abstract called the “Project Summary”. This summary requires the proposer to address two specific review criteria: Intellectual Merit and Broader Impacts.

Intellectual Merit

Potential considerations include: How important is the proposed activity to advancing knowledge and understanding within its own field or across different fields?

How well qualified is the proposer (individual or team) to conduct the project? (If appropriate, the reviewer will comment on the quality of prior work.)

To what extent does the proposed activity suggest and explore creative, original or potentially transformative concepts?

How well conceived and organized is the proposed activity?

Is there sufficient access to resources?

Broader Impacts

What are the broader impacts of the proposed activity?

• How well does the activity advance discovery and understanding while promoting teaching, training and learning?

• How well does the proposed activity broaden the participation of underrepresented groups (e.g., gender, ethnicity, disability, geographic, etc.)?

• To what extent will it enhance the infrastructure for research and education, such as facilities, instrumentation, networks and partnerships?

• Will the results be disseminated broadly to enhance scientific and technological understanding?

• What may be the benefits of the proposed activity to society?

From the National Science Foundation Grants Proposal Guide http://www.nsf.gov/pubs/gpg/
This proposal aims to integrate graduate training in optics at the University of Oregon (UO) and to effect cultural changes in our education and research program.

**Intellectual Merit:** The control of dynamical processes and physical systems at the quantum level represents a grand challenge for advancing information and sustainable energy technologies. Fundamental to these scientific endeavors is the understanding and ultimately the control of quantum coherences. For example, electronic and photonic devices and systems that can exploit quantum coherences to communicate and process information may lead to a revolution in our understanding of physical processes as well as our ability to solve currently inaccessible computational problems. Understanding and harnessing quantum coherences in photosynthetic or related processes may also give rise to potential avenues of highly efficient and sustainable energy resources.

The proposed IGERT program brings together internationally recognized research groups in the UO physics and chemistry departments spanning the fields of: atomic physics, quantum optics, molecular dynamics, and materials and nanostructures. The program integrates the diverse research interests, capabilities, and expertise into a cohesive and collaborative program to tackle the scientific and technological issues of optical control in atomic systems, molecular complexes, and engineered nanostructures, utilizing the interstitial research thrust of photo-energetics and with an emphasis on the understanding and control of quantum coherences in these systems.

The central component of the proposed IGERT program is the creation of a graduate certificate program in optics that includes interdisciplinary curriculum, professional concentrations, and professional development. Graduate training of IGERT fellows will commence with intensive summer courses and labs across thrust areas. These courses will be designed for students with diverse backgrounds in chemistry and physics, preparing them for subsequent lab rotations and courses outside their specialty.

**Broader Impact:** Graduates of the optics IGERT program will become leaders and agents of change in education and research in areas that are of both scientific and technological importance to society. The graduates will also be poised to transform scientific and technological advances into real-world applications.

The optics IGERT program will also be an effective mechanism to recruit graduate students, especially women and those from under-represented groups. For more immediate results we have begun developing pipelines with institutions that serve underrepresented groups. We recognize that for the long-term success in recruiting and retaining under-represented students, we will need to start the outreach process at a much earlier stage. Our outreach efforts will include summer optical science discovery camps for middle and high school students and research opportunities for high school students.

The optics IGERT program emphasizes three elements that have thus far limited the effectiveness of our current education model: community, connection, and collaboration. In the current model, students are often isolated into microcosms defined largely by funded research and are disconnected from resources for their professional development both on campus and in the wider community. Students also lack the support and/or training to develop and engage in collaborative research efforts. Addressing these limitations will necessitate a cultural change for both students and the faculty, with the IGERT program serving as a catalyst. The IGERT program will foster a community through weekly seminars, peer mentoring, workshops, an annual retreat, and continuous internal evaluation based on feedback from an IGERT student advisory committee. The IGERT program will also enhance professional development via the Proposal Training and Workshop Competition and the Science Entrepreneurship Workshops and will develop partnerships and networking both within campus, through workshops and mini retreats, and outside campus, through industrial internships and international collaborations. A collaborative environment will be promoted through co-advising, lab rotation, international internships, as well as integrated training and curriculum across departments and thrust areas.

**Key Words:** Physics, Chemistry, Materials Research, Quantum Coherences
Proposal Narrative

Also known as the project description, the proposal narrative is the core of the research proposal. This is where the proposer identifies the problem to be addressed and lays out the proposed research/activities.

A typical research proposal narrative contains the following parts:

- Background & Significance
- Problem Statement
- Prior Results/Preliminary Data
- Proposed Experiments
- Expected Results
Background and Significance

Also known as the literature review, the background and significance is where you lay out your theoretical foundations and the context of the project. The length of the literature review will depend on the topic and the formatting restrictions but 2-5 pages is typical.

Four Elements of a Literature Review

- Identifies and organizes research and theory directly related to the research question
- Synthesizes results most salient to the research question and points out what is missing
- Identifies areas of disagreement or controversy
- Formulates questions that need further research

Background: What has been done so far?

Significance: Why is this research important?

Briefly sketch the background leading to the present application, critically evaluate existing knowledge, and specifically identify the gaps that the project is intended to fill. State concisely the importance and relevance of the research described in this application by relating the specific aims to the broad, long-term objectives. If the aims of the application are achieved, state how scientific knowledge will be advanced. Describe the effect of these studies on the concepts, methods and technologies, that drive this field.

Two distinct but inter-related purposes:

Background: Thoroughly review research to date relevant to your proposal

Significance: Establish why the proposed research matters, making an important contribution of new knowledge

*Background provides the context for significance and shows gaps in knowledge. Significance raises interest and provides the context for organizing and understanding background research.*

Significance sandwich

- Overall significance, problem, question
- Background research
- Specific significance
Background Search

Missing important published studies is one reason for a proposal being marked down. Finding all the relevant research: Electronic search terms, Published reviews, Hand searches of key journals, Branching through citations, Science Citation Index traces, Colleague pre review. What organizing theories are relevant? What theory guided your study design, selection of measures and methods? What theory or theories would be tested in the proposed study? Are there theories that make conflicting predictions?

Strongly recommended that you outline this section before writing.

A logically organized flow that is easy to read and follow that leads right up to the doorstep of the research that you propose to do and shows how your research will fit in, extend, complement, or challenge current knowledge and theory.

The overview: So what? Who cares?

- Why does research in this area matter?
- How will this benefit the sponsor’s objectives?
- Is there a practical problem addressed by this research?

Specific Significance

- How will your research be an advance?
- How is this a logical next step?
- What new knowledge will result? Does it fill in a gap in research to date?
- How will this knowledge be applicable?
- Where is this line of research going? Where might it lead? (If in response)
- How is your research relevant to the needs stated in the PA, RFA, or RFP?

*W. Woodal Senior Research Scientist and Professor of communication. CASAA-UNM
Problem Statement

A research project must always propose a solution to a problem. The absence of something is not a problem in and of itself.

The connection between funder and researcher lies in a common desire to solve the problem. The problem statement should be a clear description of the problem and why it is significant.

Important Notes about the Problem Statement:

- The problem is the reason for the project
- The problem statement should be well thought out and backed by data
- The problem should be logical and specific
- Keep it short and pithy

Problem Statement Checklist:

- Describe broad problem – the major symptom of the real problem
- Describe causes of broad problem – the real problem
- A problem should be cited for each project component
- Data and citations for each assertion
- Data placing your situation in perspective
- Extensive data should be placed in tables
- Historical perspective
- Impact of Problem

Notes:

Proposed Experiments/Activities

The funder needs as complete a description as possible to choose from among the many proposals received. A well-thought out, well laid out experiment shows the funder that you can deliver on your promises.

The description of experiments/activities should clearly describe what you intend to do, what your institution plans to contribute and what role the funder is asked to play.

Important Notes about the Proposed Experiments:

- Clear and concise
- No jargon, keep technical language to a minimal, necessary level
- Cover Major Project events
- Present project events in a logical order
- Clarify unusual budget requests – if an experiment requires a special piece of equipment or service explain why and how that will be accomplished
- Include charts and figures as necessary
- Format as funder requests
- Address all special conditions the funder requests
- Be honest, do not shy away from uncertainties

Expected Results

Project outcomes, mission, goals and objectives, or results, no matter what they are called, the funder wants to know what you expect will result from the proposed experiments.

Sometimes this section will come before the project narrative. Expected results should be covered, in brief, in the summary as well.

Important Notes about the Expected Results:

- Detailed and measureable
- Goals are steps to accomplish the mission
- Objectives are steps to accomplish each goal
- Goal statements should contain the following:
  - What are you going to do?
  - What approach you will use?
  - Who is responsible?
  - How may, how much?
  - What will be the results (outcomes)?
- Objective statements should include the following:
  - What are you going to do?
  - What approach you will use?
  - Who is responsible?
  - How may, how much?
  - What will be the results (outcomes)?

Curriculum Vitae/Biosketch

The CV tells the sponsor about you. A CV is a succinct list of your accomplishments, education and experiences. Almost all funders require CV’s for the principle investigator and key personnel. Most funders require specific formatting for the CV.

CV length depends on sponsor requirements and the experience of the proposer. CV’s for Ph.D students and recent graduates are usually two pages long.

Important Notes about the CV:

- Follow sponsor requirements or requests
- Preparation is important – be concise, but don’t leave anything out
- If you have no employment experience in your field, increase the detail about your education
- A brief “Objectives” statement is appropriate for younger scholars, but should not take up more than ¼ of a page
- Concentrate on you most recent education and training
- Carefully proof-read
- Bullet points and lists are good
- Use consistent, reader friendly formatting
- Tailor the CV to the funder
- Detail experience/education in reverse chronological order
- Do not leave gaps
- Do not get creative with paper, formatting, or try to be funny
BIOGRAPHICAL SKETCH  MIRIAM DEUTSCH

Affiliation: Department of Physics, University of Oregon, Eugene, OR 97403.
   Voice: 541-346-5973;   Fax: 541-346-4315; Email: miriamd@uoregon.edu

   M. Sc. in Physics, The Hebrew University in Jerusalem, Israel, 1990.
   B. Sc. in Physics and Atmospheric Science, The Hebrew University in

Professional Experience:
   University of Oregon  2007 – present  Associate Professor, Department of Physics.
   University of Oregon  2000 – 2007  Assistant Professor, Department of Physics.
   Sciences.
   Princeton University  1996 – 1998  Post-doctoral Scientist, Dept. of
   Electrical
   Engineering.

Teaching Experience:
   2001 - present  Department of Physics, University of Oregon.
   Course taught for undergraduate level: Quantum Mechanics, Classical and
   Modern Optics, Physics of Sound and Music, Physics of the Internet, Foundation
   of Physics.
   1995-1996,  Teaching Assistant, Racah Institute of Physics, Hebrew University.
   1989-1992  Courses taught for undergraduate level: Mechanics, Electricity and Magnetism,
   First Year Physics Lab, Solid State Physics.
   Courses taught for graduate level: Plasma Physics.

Professional Activities:

Member of the APS, MRS, OSA.

Scientific reviewer for OSA journals, Science, Physical Review E, Reviews of Modern

Scientific reviewer of proposals for:
   NSF ECS: Electronics, Photonics and Device Technologies
   NSF DMR: Electronic Materials
   Army Research Office, Physics Division
   U.S. Civilian Research and Development Foundations
   Science Foundation Ireland

Five related publications:
   • Metamaterial Coatings for Broadband Asymmetric Mirrors, A. Chen, K. Hasegawa, V.A.

**Five other publications:**


**Current Collaborators:** Jim Hutchison, (Chemistry, University of Oregon)
Viktor Podolskiy (Physics, Oregon State University)
Jens Nöckel (Physics, University of Oregon)

**Past Collaborators:** Richard Averitt (Los Alamos National Lab)

**Graduate Advisor:** John E. Golub

**Post Graduate Advisors:**
David J. Norris, University of Minnesota (previously NEC)
Stephen Forrest, University of Michigan (previously Princeton)
Keren Bergman, Columbia University (previously Princeton)

**Current Graduate Students:** Aiqing Chen, Sarah Emmons, Keisuke Hasegawa, Charles Rohde, Lawrence Davis.
References

References are where you demonstrate your credibility as a proposer. The bibliography also demonstrates the relevance of the work you propose. That is why it is important to cite recent relevant and landmark references in your bibliography. Reviewers will look at your references.

Important Notes about the References:

- Use recent work to emphasize the current importance of your proposed research
- If you expect a reviewer who is doing work in this area cite him/her (as appropriate)
- Do not include references you have not used
- Quote and reference funder sponsored studies or efforts in the area
- Format in as the funder requires, or if there are no requirements in a manner consistent with your field (using the format of a journal in which you might publish is typical)

Notes:
Support

Many sponsors will want to know what current and recent sponsorship you have received. This helps them assess your credentials as a researcher and verify that you are not proposing research you have performed before.

Some sponsors will not accept proposals for research submitted to other funders simultaneously.

SAMPLE NSF SUPPORT

CURRENT AND PENDING SUPPORT    MIRIAM DEUTSCH

Current Support

- CAREER: Fabrication and Optical Properties of Novel Self-Assembled Photonic Crystals
  PI: M. Deutsch
  Source of Support: NSF DMR Electronic Materials
  Total Award Amount: $585,909
  Starting Date: 3/1/03; Ending Date: 2/28/08

- Active Plasmonic Materials: Towards Ultra-Fast Light Control on the Nanometer Scale
  Co-PIs: M. Deutsch, V. Podolskiy (OSU)
  Source of Support: ONAMI ONR Nanometerology and Nanoelectronics Initiative
  Total award amount: $103,741 combined (M. Deutsch part: $56,333)
  Starting Date: 1/1/07; Ending Date: 12/31/07

Pending Support:

- ONAMI Research Center: Nanoarchitectures for Enhanced Performance Electromagnetically induced Transparency and Nanostructure
  Co-PIs: M. Deutsch, V. Podolskiy (Oregon State University Physics)
  Submitte to: DoD Army Research Office
  Total award amount: $40,000 (M. Deutsch part: $20,900)
  Proposed Starting Date: 12/15/08; Ending Date: 12/14/10

Recent Ended Support:

- Electro-plasmonics: merging nano-plasmonics with electro-optics
  Co-PIs: M. Deutsch, V. Podolskiy (Oregon State University Physics)
  Source of Support: ONAMI ONR Nanometerology and Nanoelectronics Initiative
  Total award amount: $115,816 combined (M. Deutsch part: $65,161)
  Start Date: 1/1/04; End Date: 12/31/06
Facilities & Equipment – Sample Statement

**Laboratory:** The PI has over 800 square feet of laboratory space, in addition to a fume hood and work area installed external to this (for work safety reasons, as dictated by the university facilities management). The essential equipment for fabrication of metal nanoparticles, metal thin films, metaldielectric core/shell systems and self-assembled structures has been acquired and operated. A fully equipped optics lab has been established.

**Major Equipment:** The synthesis lab houses a 6’ fume hood, a variety of glassware, measuring and distillation equipment, drying oven, programmable tube furnace, centrifuge, critical point dryer, inspection microscope equipped with video camera, vacuum system and chemical reagents. A particle-size analyzer (Brookhaven National Instruments BI-90) has been acquired for characterization of colloidal particles. For optical studies, we have two Newport optical benches. The major optical instrumentation consists of a Spectra Physics Millenia 5W pump laser, Coherent Verdi 10W pump laser, mode-locked 100fs Ti:Sapphire laser, Coherent OPO, HeNe and YAG lasers, three spectrometers (equipped with low- and high-resolution gratings for visible, NIR as well as Raman spectroscopy,) liquid-nitrogen cooled CCD (JY Horiba), Leica inverted DIC microscope, oscilloscopes, lock-in amplifier, and a variety of optics, detectors, optical hardware and mounting components.

**Computers:** The lab houses two Pentium-processor based computers dedicated to data acquisition and processing, as well five additional computers for use by individual group members. We have recently purchased an additional computer which we are installing as a server.

**Other Resources:** The PI is a member of both the Oregon Center for Optics (OCO) Shared Laser Facility and the Materials Science Institute (MSI), and has access to all resources provided by these groups. The Laser Facility houses several continuously tunable lasers (ultrafast Ti:Sapphire and diode lasers), Q-switched Nd:YAG lasers and optical parametric amplifiers. Funds for the acquisition of a cluster computer have recently been awarded to the OCO by the NSF.

The MSI provides use of vacuum evaporators, photolithography lab, focused ion-beam milling system, thin film analysis by x-ray diffractometry and spectroscopic ellipsometry, and a probe station for device testing. In addition there is free access to labs housing a UV-Vis spectrometer, IR spectrometers, atomic force microscope and an ultracentrifuge facility. The PI has also access to a transmission electron microscope (Biology Department) and two scanning electron microscopes for sample characterization, for a nominal user fee. An additional new Zeiss scanning electron microscope, dedicated for e-beam lithography has been recently acquired and installed, and is currently fully operational. Professionally staffed machine and electronics shops are available for in-house fabrication of equipment and consultations.

**Office:** Administrative office support is provided by the OCO and MSI.
Responsible Conduct of Research Resources

UO Human Subjects Manual
http://www.uoregon.edu/~humansub/docs/manual.pdf

UO Human Subjects Main Page
http://www.uoregon.edu/~humansub/

Human Subjects Training
http://www.uoregon.edu/~humansub/education.htm

Vertebrate Animals
http://ovsac.uoregon.edu/

Conflict of Interest
http://orcr.uoregon.edu/node/13

Office of Environmental Health and Safety
http://oehs.uoregon.edu/
Grant Parts for Fellowships

The research portion of a graduate or postdoctoral fellowship is typically shorter and less ambitious than an associate professor level proposal. Sponsors want to see evidence of a training plan and potential for the candidate to become an accomplished scholar. To this end, they typically request certain supplemental materials.

Some typical fellowship proposal components:

- Training Plan – A shorter version of the proposal narrative with special attention paid to techniques the trainee plans to master.

- Supervision Plan – the advisors plan and commitment for the student. Typically written in letter format with sponsor specifications.

- Previous Research Experience – Brief narrative of the candidates research experience and training. Explains how previous training is relevant to the proposed plan

- Personal Statement – Brief (2-4 pages) discussion of the candidates experience and motivation.

Important notes for writing fellowship proposals:

- Clear & concise

- Emphasize recent and transformative experiences

- Identify competencies and demonstrated skills

- Follow sponsor formatting and specifications

- Be honest

- Grab the readers attention
Personal Statement

The person statement is the applicant’s introduction to the reviewers. It is a chance to identify your scientific interests. The essay is an exercise in self-reflection. To do this well requires many drafts and revisions. A quality personal statement alone will not ensure funding, but a poor one can certainly hinder the chances of funding.

Personal statements for fellowships are similar to college application essays but with a more defined focus. Common elements include a description of your course of study or project, and why you have chosen this particular institution, country, or setting. You should provide evidence that you are qualified to undertake the program you propose, and that it is consistent with your long-range plans. For study abroad project proposals, if possible provide evidence of cooperation of the host institution or individuals with whom you propose to work. For a plan of research essay, devote considerable effort to your "methods" as you need to demonstrate you have a plan, not just a good idea.

Important Notes about the Personal Statement:

- Follow the instructions
- Incorporate one or two themes that make your point
- Incorporate concrete examples
- Talk about what excites you
- Do not tell your life story
- Use good writing techniques
- Be honest

Worcester Polytechnic Institute -
http://www.wpi.edu/Academics/FS/essays.html
Requests for Proposal

Sponsors typically post their eligibility requirements and guidelines for proposal in documents called Request for Proposal (RFP), Program Announcement (PA) or Broad Agency Announcements (BAA). The documents lay out the agency mission, the area of interest for the program, eligibility requirements, formatting guidelines, reporting requirements and the review process.

Before submitting any proposal it is vitally important to thoroughly review the RFP. Most RFP’s provide the contact information for a program manager. Program managers often have even more information than is available in the RFP and may be able to help you target your proposal in the most productive direction. Many (but not all) program managers are happy to discuss your proposal and give advice. Program managers are very busy, however, so make sure you have carefully reviewed the RFP and thought out your proposed project before contacting a program manager with questions.

Important Notes about the RFP:

- Read the RFP carefully
- **Format the proposal as outlined in the RFP**
  - Do not try to “get away” with questionable formatting
  - Respect the sponsor’s requests
- **Use the sponsors language**
  - Do NOT:
    - Throw around empty buzz words
    - Attempt to mock or otherwise be humorous with sponsor requirements
  - DO:
    - Explain how you are addressing the sponsors requirements
    - Give careful consideration to sponsor concept words and phrases
- **Reread the RFP before submission**
Important Notes

Look at funded samples from the sponsor.

Visit the sponsor web site.

   What are the sponsor’s current interests?

   Past and future interests.

   What are they funding?

   You may think your proposal is relevant, but they may not.

Call a program manager to discuss your idea

Talk with researchers who receive funding from the sponsor

Show your Proposals to others

   Fresh eyes help.

   Listen to comments with an open mind.

Revise, Revise, Revise