Academic Mentoring Workshop

Writing Competitive Research Proposals

Timothy M. Pinkston
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Types of Proposals

- **Research**
  - SIRP
  - Multi-investigator

- **Research Infrastructure**

- **Education**
  - Curriculum Development
  - Educational Innovation

- **White Paper, Special Projects, RAPID, EAGER, Travel, Workshops, Postdoctoral Fellowships, Faculty Fellowships (industry or foundations), etc.**

- **Supplements** – standard, REU, RET, ROA

- **SBIR, STTR**

Adapted from Bryant York, PSU
Meta-Tips

• **Know the agency’s organizational structure**
• **Know your agency’s programs**
  – Solicited vs. unsolicited proposals
• **Review the Summary of Awards**
  – Past trajectory
• **Know your program officer and division director**
  – Current trajectory
• **Participate in agency-sponsored workshops**
  – Help set future trajectories
• **Serve on review panels and as an ad hoc reviewer**
  – Read lots of proposals
  – Practice good citizenship
• **Develop good proposal-writing habits**

Adapted from Bryant York, PSU
✓ Types of Proposals and Meta-Tips

• General Funding Agency Information
  – DOD
  – NSF

• Research Proposal Preparation

• Tips for Writing Successful Proposals

• Some Fatal Flaws in Proposal Writing
NSF 2012 budget request: $7.77 billion (13% increase over 2011)
CISE 2012 budget request: $728.4 million (17.7% increase)
NSF CISE Directorate

Office of the Assistant Director for CISE

Computing and Communications Foundations (CCF)
- Algorithmic Foundations (AF)
- Communications and Information Foundations (CIF)
- Software, Hardware Foundations (SHF)

Computer and Network Systems (CNS)
- Computer System Research (CSR)
- Networking Technology and Systems (NeTS)

Information and Intelligent Systems (IIS)
- Human-Centered Computing (HCC)
- Information Integration and Informatics (III)
- Robust Intelligence (RI)

Crosscutting CISE, NSF Emphasis Areas
- EiC
- CDI
- CPS
- SHW
- TC
- NetSE
- BPC
- CPATH
- REU/RET
- CAREER
- ADVANCE
- IGERT, GK-12
Office of the Director

Office of the Assistant Director for ENG

CBET
Chemical, Bioeng, Environmental, and Transport Systems

Clusters
- BEEH
- CBBS
- EES
- TTFP

CMMI
Civil, Mechanical, and Manufacturing Innovation

Clusters
- AM
- M&EM
- RSI
- SED

ECCS
Electrical, Communications, and Cyber Systems

Clusters
- EPMD
- EPAS
- CCSS

EEC: ENG Education and Centers division
- ERC
- EEP
- BRIDGE
- CAREER
- REU/RTE

EFRI
Emerging Frontiers in Research and Innovation

(a new division within ENG as of October 1, 2006)
✓ Types of Proposals and Meta-Tips

✓ General Funding Agency Information
   - DOD
   - NSF

• Research Proposal Preparation
  (some slides adapted from Don Ethlon, NSF)

• Tips for Writing Successful Proposals

• Some Fatal Flaws in Proposal Writing
A fundable proposal describes a good idea and attainable goal, well expressed and motivated, with a clear indication of methods for pursuing the idea, evaluating the findings, making them known and having broad impact.
Step 1: Carefully Read the Program Announcements and Solicitations

• **Find the right program early!**
  – It’s better to do this well before you write than after you get your reviews back

• **Talk with your Program Director to make sure that your ideas fit in the program**
  – If the Program Director (PD) tells you that your ideas are too narrow or don’t fit the program, look for other sources

• **Make sure that your project is worthwhile, realistic, well-planned, and innovative**
Step 2: Develop Your Good Idea

• **Key Questions**
  – What do you intend to do and how will you do it?
  – Why is it important?
  – What does the literature provide?

• **Make sure the idea is innovative and exciting**
  – Survey the literature
  – Talk with others in the field

• **Convince people that you can do it**
  – Obtain preliminary data to support feasibility
  – Determine available facilities and resources
    • What infrastructure do you have to work with?
    • With whom will you work (students, collaborators, industry partners)?
Step 3: Prepare the Proposal

- NSF Grant Proposal Guide (GPG)
  http://www.nsf.gov/pubs/policydocs/pappguide/nsf08_1/gpg_index.jsp
- Get it - Read it - Follow it
- Proposal preparation and submission
- Submission of collaborative proposals via
  - Subaward
  - Separate, yet linked, proposals
- Review criteria and review process
- Return without review criteria
- Withdrawal, declination, and award processes
Parts of a Proposal (NSF)

- **Cover Sheet and Certifications**
- **Project Summary**
  - Both intellectual merit and broader impacts described
- **Table of Contents**
- **Project Description**
- **References cited**
- **Biographical Sketches**
- **Budget and Budget Justification**
- **Current and Pending Support**
- **Facilities, Equipment and Other Resources**
- **Supplemental Documentation**
  - *Data Management Plan (new)*; other docs vary by programs
- **Single Copy Documents**
  - Reviewer suggestions, deviation authority, confidential information, etc.
Project Summary

• **This one page is critical because it:**
  – It may affect which program or panel will review your proposal
  – Written in 3rd person, it must include a statement addressing both merit review criteria: *Intellectual Merit* and *Broader Impacts*
    - Proposals that do not separately address both criteria within the one-page Project Summary will be returned without review

• **Intellectual Merit**
  – Describe the scientific/engineering problem and its importance
  – State the overall objective of the project
  – State the specific aims
  – Describe how the aims will be achieved

• **Broader Impacts**
  – Educational & outreach activities; infrastructure; dissemination of results; underrepresented groups; benefits to society
• This is the key to a strong proposal
• Overall concept and rationale
• Hypothesis-driven or data-driven (or other)
• **Execution**
  – Careful
  – Thorough
  – Appropriate
• **Warning:** Most NSF formal proposals are limited to 15 pages. Some preliminary proposals and other special cases may be limited to fewer pages. Check the program solicitation!
Project Description

In 15 pages, you need to cover

• Objectives and expected significance
• Relation to present state of knowledge
• Experimental methods and procedures
• Results from prior agency-sponsored support (required, if applicable)
• Relation to your (the PI’s) longer term goals
• Optional sections:
  – preface, background, preliminary studies, specific objectives, significance, experimental plan
Know your audience – the reviewers, PD!

- Write accurately, concisely, and clearly
- Make it easy for reviewers to like your proposal
- You never get a second chance to make a first impression
- First page tells it all
- Figures and tables get your points across clearly
- Some reviewers (particularly on interdisciplinary proposals) may not be experts in your specific field
Biographical Sketch

- Usually limited to only two pages
- Professional preparation
- Appointments
- Publications
  - 5 closely related
  - 5 other significant publications
- Synergistic activities
- Collaborators & other affiliations
  - Collaborators (last 4 yrs) & co-editors (last 2 yrs)
  - Graduate and Postdoctoral Advisors
  - Thesis Advisor and Postgraduate-Scholar Sponsor
• **Budget should be**
  – reasonable, but request what you need
  – for personnel, equipment, travel, participant support and other direct costs (subaward, consultant, computer services, publication costs)
  – for cost of educational activities associated with research, where appropriate

• **Must be accompanied by “Budget Justification” for direct cost line items**
Current and Pending Support

- **List everything, including the proposal being submitted**
  - current, pending and anticipated
- **Be careful of overlap**
  - Perception of overlap could be detrimental in the review
- **Multiple submissions**
  - when they are allowed to same program
✓ Types of Proposals and Meta-Tips

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  – DOD
  – NSF

✓ Research Proposal Preparation
  (some slides adapted from Don Ethlon, NSF)

• Tips for Writing Successful Proposals
  (some slides adapted from Don Ethlon, NSF)

• Some Fatal Flaws in Proposal Writing
Get Help

• **Read:**
  – Sponsoring agency publications
  – Successful proposals

• **Look before you leap:**
  – Serve as a reviewer and panelist

• **Talk with people in-the-know:**
  – Current Program Directors
  – Former PDs (rotators or IPAs)
  – Successful colleagues
  – Sponsored projects office at your institution
Start Early and Get Feedback

• **Write:**
  – Rewrite and rewrite again…

• **Get critiques from:**
  – Mentors and colleagues
  – Previous members of review panels
Be Reasonable

• **Be aware of the scope:**
  – “Too ambitious” vs. “Too narrow”

• **Be honest and up-front:**
  – Address issues instead of trying to hide them
  – Acknowledge possible experimental problems and have alternatives
• **Know your audience:**
  - All reviewers may not be experts in your specific field

• **Simplify and streamline:**
  - Make sure you get your main idea across

• **Pay attention to details:**
  - Run the spell checker and proof-read
  - Prepare clear photos, graphs, etc.
  - Make the font size as big as you can (minimum of 6 lines per inch with 1” page margins!)
The **Intellectual Merit** of the proposed activity

- Creativity, originality, *and potentially transformative*
- Potential to advancing knowledge and understanding within and across fields
- Conceptualization and organization
- Qualifications of investigators
- Access to resources
Funding Criteria: Intellectual Merit

- How *important* is the activity to *advancing knowledge and understanding* within the field or across different fields?
  - *Significance of expected results*: incremental? high impact? high-risk but high-gain?
- How well *qualified* are you to conduct the research?
  - Not necessary to have track record on specific topic, but *quality of prior work* usually a consideration, as are *preliminary results*
- How creative, *original* are the concepts and ideas?
  - Should be *ground-breaking* in some aspect
- How well conceived, *organized* is the proposed activity?
  - *Well-articulated problem* and *well-structured research plan*
- Is there sufficient access to *resources*?
  - Ownership is not necessary, only *access* to equipment, facilities, human capital, …
The **Intelectual Merit** of the proposed activity

- Creativity, originality, and potentially transformative
- Potential to advancing knowledge and understanding within and across fields
- Conceptualization and organization
- Qualifications of investigators
- Access to resources

• The **Broader Impacts** of the proposed activity

- Discovery while promoting teaching, training and learning
- Participation of underrepresented groups
- Enhancement of infrastructure for research and education
- Dissemination of results to enhance scientific and technological understanding
- Benefits to society
Funding Criteria: Broader Impacts

• Does the activity advance discovery and understanding while promoting teaching, training and learning?

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

• 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 other disciplines and society as a whole?

(See www.nsf.gov/pubs/gpg/broaderimpacts.pdf)
The **Intellectual Merit** of the proposed activity
- Creativity, originality, and potentially transformative
- Potential to advancing knowledge and understanding within and across fields
- Conceptualization and organization
- Qualifications of investigators
- Access to resources

• **The Broader Impacts** of the proposed activity
  - Discovery while promoting teaching, training and learning
  - Participation of underrepresented groups
  - Enhancement of infrastructure for research and education
  - Dissemination of results to enhance scientific and technological understanding
  - Benefits to society

• **Program-specific merit review criteria**
  - Some programs have additional review criteria in solicitation

• **There are NSF general statements regarding intellectual merit and broader impact, but also some programs list examples of these criteria specific to the program**
Evaluation: Ad Hoc and Panel Reviews

- **A minimum of 3 reviews/proposal (typically 4 or more)**
  - A score of *E, V, G, F, P* is given by each reviewer
  - *Comments* on intellectual merit and broader impacts
  - Typically, a *recommendation* to fund (or not) is given

- **Panel Review:**
  - Proposals are discussed and *evaluated collectively*
  - *Proposal summary* is written—couple of sentences
  - Intellectual merits are described: *strengths and weaknesses*
  - Broader impacts are described: *strengths, weaknesses*
  - *Improvements* may be suggested (optional)
  - *Panel recommendation*: *Competitive* or *Not Competitive*

- *Comments are intended to help* unsuccessful PIs improve their proposals for the next competition
Basis for Decisions: Reviewer Input

• **Reviews**
  – Content/justification of the reviews by reviewers oftentimes is more important than just the rating

• **Panel Ranking**
  – Proposals (competitive ones) often ranked by panel

• **Program Director uses reviews and panel summary/recommendation in award decisions**
  – Fairness
  – How substantive the reviews are
  – Technical problems raised in the reviews
    • major vs. minor issues
  – Reasons for the reviewer concerns or enthusiasm
• Program Director uses other information in addition to reviewer input in making decisions

  – Innovation and creativity
    • High risk, high reward projects
  – Breadth of research areas
  – Priority areas and systems
  – Demographics and diversity
  – Broadening participation
  – Institutional impact: EPSCOR, MSI, PUI, etc.
  – Integration of research & education
  – International collaborations
Number of FY’03 Proposals: 29,164 Declines, 10,791 Awards (37% success)
✓ Types of Proposals and Meta-Tips

✓ General Funding Agency Information
  – DOD
  – NSF

✓ Research Proposal Preparation
  (some slides adapted from Don Ethlon, NSF)

✓ Tips for Writing Successful Proposals
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• Some Fatal Flaws in Proposal Writing
Why Do Some Proposals Fail?

- **Absence of innovative ideas or hypothesis**
  - Will provide only an incremental advance
  - Not exciting or cutting edge
- **Errors**
  - Unclear or incomplete expression of aims
  - Faulty logic or experimental design
  - Less than rigorous presentation
- **Unrealistic, sloppy or incomplete**
- **Resources and facilities not in place**
  - PI qualifications/expertise not evident
  - Necessary collaborations not documented
Seven Deadly Sins of Proposal Writing

1. Failure to focus on the key problems and payoffs
2. No persuasive structure: *poorly organized*
3. No clear differentiation: *competitive analysis*
4. Failure to offer a compelling value proposition: *potential impact*
5. Key points are buried: *no highlights, impact is lost*
6. Difficult to read or appreciate: *full of jargon, too many low-level technical details or not enough details*
7. Credibility killers: *misspellings, grammatical errors, wrong technical terms, inconsistent format, …*
Get Support in Proposal Writing

• **Agency Publications**
  – Program Solicitations
  – Grant Proposal Guide
  – Web Pages
  – Funded Project Abstracts
  – Reports, Special Publications

• **Program Directors**
  – Incumbents
  – Former “Rotators”, “IPAs”

• **Mentors on Campus**

• **Previous Panelists**

• **Serving As A Reviewer**

• **Sponsored Research Office**

• **Successful Proposals**
Closing Remarks

• There may be no “best” (or only) way to write a competitive research proposal, but many successful ones share similar characteristics
  – clearly written, well motivated, organized, original, targeted, important, accomplishable, impactful, significant

• Funding depends on many things, some of which are beyond your control
  – availability of funds, portfolio of existing funded research projects, set of reviewers, timing, …

• Be persistent and give your best effort; success will come!
Useful NSF On-line Documents

- **FY 2012 NSF Budget Request**

- **FY 2011 NSF Budget**

- **Grant Proposal Guide (NSF 04-23)**

- **Science and Engineering Statistics**

- **General Information**
Back- ups
NSF Proposal Review and Award Process & Timeline

Organizations submit proposals via FastLane.

- NSF Program Director

NSF Proposal Generating Document

- Proposal Receipt at NSF: 90 Days

- Proposal Processing Unit

- Minimum of 3 Reviews Required

  - Mail
  - Panel
  - Both

- Program Director Analysis & Recommendation

- Division Director Concur

- Decline

- Organization

- Award Via DGA

- DGA Review & Processing of Award: 30 Days

- Proposal Review and Decisions: 6 Months

- Returned As Inappropriate/Withdrawn
“Transformative Research is research driven by ideas that stand a reasonable chance of radically changing our understanding of an important existing scientific concept or leading to the creation of a new paradigm or field of science. Such research also is characterized by its challenge to current understanding or its pathway to new frontiers.”

Baseball Analogy: How to make a “successful” pitch?

- **Pitcher**: you are the one who has “goods” that need to be pitched (conveyed or put across) “home plate”

- **Goods**: project (research ideas) you propose for funding

- **Home Plate**: the collective body of reviewers and program officer who decide if pitch “strikes” the target

- **Opposition**: the problem space in your area of research

**Your task**: Successfully pitch your ideas and strike out the opposition, as judged by the umpire (reviewers, PO)
Writing a “Successful” Proposal

- **Three phases**: set-up, delivery, follow-through

- **Set-up phase**: set the stage for the “appropriate” pitch
  - Take into account previous events leading to current state
  - Convince home plate that
    - you have sufficiently assessed and can “take down” opponent
    - your pitch is worthwhile and significant to accomplish this
    - you have identified where your pitch is headed (the target)
  - If no set-up phase, who knows where your pitch is going or if it is the right pitch to make at this time for this opponent?

- **Set-up phase in proposal writing**: place research in context, giving current state-of-the-art and key challenges
  - Clearly articulate **problem**, your mastery of understanding it, and why solving it is important \(\rightarrow\) **importance, significance**
  - Discuss how prior work fails to sufficiently address it
  - Clearly frame your proposed **idea & approach** \(\rightarrow\) **originality**
Writing a “Successful” Proposal

- **Three phases**: set-up, delivery, follow-through

- **Delivery phase**: mechanics that go into executing the pitch
  - The pitcher is channeled, focused, directed
  - Best effort is put forth to structure the delivery of the pitch
  - Mechanics are followed for “delivering the goods”
    - precise
    - targeted
    - accurate

- **Delivery phase in proposal writing**: provide a detailed description of various components of the proposed research
  - Should provide substance (“mass”) to substantiate the validity and promise of the proposed idea → preliminary results
    - Discuss tradeoffs and possible new problems that may arise
    - Stay focused; don’t deviate too far in morass of uncertainties
    - Write to the level that an expert on the topic would appreciate and assess that you are qualified to perform the research
Writing a “Successful” Proposal

• **Three phases**: set-up, delivery, **follow-through**

• **Follow-through phase**: without follow-through, the pitch will never reach home plate
  
  • Must see the pitch all the way through: from the fingertips to the point at which it reaches the target at home plate

• **Follow-through phase in proposal writing**: provide a plan for seeing the research through to completion
  
  • Devise an **organized** plan of attack for carrying out research
  
  • The research plan may include
    • methods/tools for analysis, simulation, evaluation, experiments
    • descriptions of your prior work, effectiveness, qualifications
    • required **resources**, personnel, collaborations, facilities
    • expected timelines, milestones, results, artifacts, prototypes, implementations, contributions, dissemination, opportunities
    • **broader impacts**: training, education, outreach, development
ACA and ARRA to grow NSF, DOE, NASA, NIST

2009 DOD does not show adds Congress will insert in the appropriations bill
Principal DOD Basic Research Funding Offices

**Service Research Offices (OXR’s)**
- Army Research Office (ARO) [www.aro.army.mil/](http://www.aro.army.mil/)
- Office of Naval Research (ONR) [www.onr.navy.mil/](http://www.onr.navy.mil/)

**Army Medical Research and Materiel Command**
- CDMRP (Congressional adds) [https://cdmrp.army.mil](http://https://cdmrp.army.mil)
- TATRC (Congressional adds) [www.tatrc.org/](http://www.tatrc.org/)

**Army Research Inst for Behavioral & Social Sciences**

**Defense Threat Reduction Agency (DTRA)**
- AMRMC Army Medical Research and Material Command
- DARPA Defense Advanced Research Project Agency
- DTRA Defense Threat Reduction Agency
- CDMRP Congressionally Directed Medical Research Program
- TATRC Telemedicine and Advanced Technology Research Center

Source: Jim Murday, USC
Defense Research Sciences (DRS) Program

What: Largest source of DOD funding for University research  
Majority invested in single investigator efforts (as opposed to URI)  
OXR DRS Broad Area Announcements (BAA) are relatively generic  
OXR Program Officer (PO) key to success (presuming convincing proposal)  
Each PO has focused interests, coupling science with some military need  
Each Service has specifically identified program interests (websites and BRP)

How Much: typically $100 – 200K/yr for three years (with continuation possible)  
OXR programs typically have ~20% turnover each year

When: Initial “white paper” useful (sometimes required)  
Proposals nominally anytime, but spring/early summer to be timely  
Most funding decisions processed in fall, early winter – after appropriation bill

Where: Mix of paper and electronic (grants.gov), see for instance  

Source: Jim Murday, USC
## Other DOD S&T Programs beyond DRS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>CDMRP</td>
<td>Congressional Directed Medical Research Programs</td>
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<tr>
<td>DMRDP</td>
<td>Directed Medical Research and Development Program</td>
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<tr>
<td>MURI</td>
<td>Multidiscipline University Research Initiative</td>
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<td>HEL MRI</td>
<td>High Energy Laser, Multidisciplinary Research Initiative</td>
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<tr>
<td>GICUR</td>
<td>Government-Industry Co-sponsorship of University Research</td>
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<tr>
<td>DURIP</td>
<td>Defense University Research Instrumentation Program</td>
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<td>DTRA</td>
<td>Defense Threat Reduction Agency</td>
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<tr>
<td>CBDP</td>
<td>Chemical, Biological Defense Program</td>
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<tr>
<td>HPC</td>
<td>High Performance Computing</td>
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<tr>
<td>YIP</td>
<td>Young Investigator Program</td>
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<tr>
<td>PECASE</td>
<td>Presidential Early Career Award in Science and Engineering</td>
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<tr>
<td>NDSEG</td>
<td>National Defense Science and Engineering Graduate</td>
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<tr>
<td>NDEP</td>
<td>National Defense Education Program</td>
</tr>
<tr>
<td>STTR/SBIR</td>
<td>Small Business Technology Transfer / Small Business Innovative Research</td>
</tr>
<tr>
<td>DEPSCOR</td>
<td>Defense Experimental Program to Stimulate Competition</td>
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Source: Jim Murday, USC
What: Research and technology where risk and payoff are both very high, and success may provide dramatic advances for military roles and missions

- Defense Science Office (DSO)
- Information Processing Technology Office (IPTO)
- Transformational Convergence Technology (TCTO)
- Microsystems Technology Office (MTO)
- Strategic Technology Office (STO)
- Tactical Technology Office (TTO)

- Larger programs available than at OXRs (some managed by OXR POs)
- Team with industrial partners
- First deliverable milestone in 12-18 months; “prototype” in 3-5 years

How much: $100K – $10M/yr in DSO, as an example

DARPA program managers often fund studies (“seedlings”) as initial research to determine if a more formal program is appropriate.

When: Variable—need to watch for program topic announcements
Involvement in topic-formative workshops very helpful

Where: [link to funding opportunities]
[link to index.html#tech]

Source: Jim Murday, USC
Recipients of DOD S&T Funds

*Includes non-profit institutions, State & local govt., & foreign institutions
Source: National Science Foundation Report, Volume 48 (FY 2003)

From OSD R&D Overview, Dr. Lewis Sloter
What is a White Paper?

The goal of a white paper is to capture the interest of a PM in your idea. Successful white papers are:

- Short and Focused
- Identify a Problem
- Describe a Solution
- Focus on Key Challenge and Effort Needed
- Outline a Decisive Plan
- Typical length ~ 1 year. Typical Budget ~$300K
- Include some graphics, and possibly a Penta-Chart

When to Send? Anytime. We receive white papers almost every day of the year.


DOD Young Investigator Programs (YIP)

What: Outstanding new faculty members at institutions of higher education, to support their defense-related research (of interest to funding agency), and encourage their teaching/research careers

- ARO, AFOSR, ONR: must be US citizen / permanent resident
- DTRA: has no citizenship or residency requirement
- DARPA: requires clearance eligibility
- Services/DTRA: received Ph.D. or equivalent degrees within the last five years
- DARPA – tenure track assistant/associate professors within 6 years of appointment

How Much: ARO - not to exceed $60K/yr for three years
            AFOSR - $120K/yr for three years
            ONR - up to $170K/yr for three years, additional support possible for capital equipment or collaborative research with a Navy laboratory
            DTRA - $100K/yr for two years
            DARPA - $300K for up to two years

When: Anytime for ARO
       July 28, 2009 for the Air Force FY10 competition
       January 12, 2009 for Naval FY09 competition
       2 November 2009 for the DTRA period 4 competition
       Feb 16, 2009 for for the DARPA FY09 competition

Where: See BAAs on OXR websites

Source: Jim Murday, USC
What: White House award to recognize some of the finest scientists and engineers who, while early in their research careers, show exceptional potential for leadership at the frontiers of scientific knowledge during the twenty-first century

- Candidates must hold tenure-track positions at U.S. Univ. or College
- Have received their Ph.D. degree within the preceding 5 years
- Typically 2 nominees per Service (and nominees from NSF)

How Much: ~$200K/yr for five years (cost borne by OXRs)

When: Submitted to White House in October

Where: OXRs submit nominees from their grantees – typically YIPs

Source: Jim Murday, USC