2nd BMES-SPRBM Conference on Cellular and Molecular Bioengineering
San Juan, Puerto Rico
January 3-7, 2012

NIH/NSF Grant Writing Workshop

Panelists:
Dennis Carter
Farshid Guilak
Jean Sipe
Joan McGowan

Session Chair: Robert Guldberg

Conference Co-Chair: Yi-Xian Qin, Dan Hammer
Mechanobiology Funding Opportunities in NSF

Professor Dennis Carter
Program Director
Biomechanics and Mechanobiology (BMMB)

2nd BMES-SPRBM Conference on Cellular and Molecular Bioengineering
January 3-7, 2012
• Introduction to NSF
• BMMB and related Programs
• Organization of Engineering Directorate
• Core funding opportunities
• Other funding opportunities of interests
• Resources
What NSF Does

• Supports all fields of fundamental science and engineering fields, except for medical sciences.

• In addition to funding research in the traditional academic areas, the NSF also supports "high-risk, high pay-off" ideas, novel collaborations and projects.

• We ensure that research is integrated with education so that today's revolutionary work will also be training tomorrow's top scientists and engineers.
What NSF Wants

Transformative research that generates ideas, discoveries, or tools that *radically change* our understanding of an important existing scientific or engineering concept or lead to the creation of a new paradigm or field of science or engineering.

Such research is characterized by its *challenge to current understanding* or its *pathway to new frontiers*. 
Proposal Funding
Summary

• NSF total annual budget ~ $6.9 billion

• NSF received 51,553 proposals in FY2011 with 11,186 awards

• 96% of the proposals are subjected to external merit review

• Funding may come from individual programs (like BMMB) or NSF-wide programs
Criterion: Intellectual Merit

- Advancement of knowledge within discipline or across different disciplines
- Qualification of the PI(s)
- Creativity and originality of concepts
- Contribution to research in science and engineering
- Proposal conception and organization
- Sufficiency of PI’s access to resources
Criterion: Broader Impact

- Advancement of discovery and understanding while promoting teaching
- Participation of underrepresented groups
- Enhancement of the infrastructure
- Dissemination of results
- Benefits to society
Presentation Outline

• Introduction to NSF
• BMMB and related Programs
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The BMMB Program supports fundamental research in biomechanics and mechanobiology. An emphasis is placed on multiscale mechanics approaches in the study of organisms that integrate across molecular, cell, tissue, and organ domains. The relationships between mechanical behavior and extracellular matrix composition and organization are of interest. In addition, the influence of \textit{in vivo} mechanical forces on cell and matrix biology in the histomorphogenesis, maintenance, regeneration, and aging of tissues is an important concern. Funded projects may include theoretical, computational, and experimental approaches. The program encourages the consideration of diverse living tissues as smart materials that are self-designing.
NSF Programs Related to BMMB

• Engineering Directorate
  – BME, Biomedical Engineering
  – BBBE, Biomedical, Biochem, & Biomass Engng
  – GARDE, General & Age Related Disabilities Engng
  – Biosensing
  – Biophotonics

• Math and Physical Sciences Directorate
  – BMAT, Biomaterials
  – PoLS, Physics of Living Systems

• Biology Directorate
  – MCB, Molecular and Cell Biology
  – IOS, Integrative Organismal Systems
• Introduction to NSF
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Presentation Outline

- Introduction to NSF
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- Resources
Core Funding Opportunities

• Direct submissions to individual Programs
  – Standard proposals
  – Workshops
• Faculty Early Career Development (CAREER)
• Broadening Participation (BRIDGE)
Steps Towards a Successful Proposal

• Begin with an email to the appropriate Program Officer with attached
  – Project summary or abstract
  – Short biography

• Get involved with NSF reviews
Standard Proposals to Individual Programs

• Proposals are usually unsolicited but may be in response to a special solicitation
• Submission windows and processes vary by programs
• Awards are typically $240-380K (total costs) for three years
Workshops

• 0-$50K Funding subject to the recommendation of the Program Officer
• Over $50K Funding subject to internal or external review
• Elements for success
  – Early contact and discussions with program officer
  – Address emerging, important themes with a specific goal
  – Lead to publication or dissemination of proceedings
  – Involves students and/or young faculty
  – Not normally intended for recurring annual meetings
Faculty Early Career Development (CAREER) Program

• Supports junior faculty who exemplify the role of teacher-scholars through
  – outstanding research
  – excellent education
  – integration of education and research
• Encourages women, members of under-represented minority groups, and persons with disabilities to apply
• ENG awards are ~$400K for 5 years
• Deadlines vary by directorate; ENG proposals due July 24, 2012

ENG Contact
Rose Wesson
Funding opportunity intended to increase the diversity of researchers through research program support early in their careers

Encourages support of under-represented groups, engineers at minority serving institutions, and persons with disabilities

Up to $175,000 over two years

Proposals due January 20, 2012
Presentation Outline

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Other Funding Opportunities of Interest

- **EFRI** - Emerging Frontiers in Research and Innovation
- **GOALI** - Grant Opportunities for Academic Liaison with Industry
- **IGERT** - Integrative Graduate Education and Research Training
- **GRF** - Graduate Research Fellowship
- **MRI** - Major Research Instrumentation
- Other Collaborative & Interdisciplinary
Resources

• Primary Source with links to everything:
  http://www.nsf.gov/

• Funding Opportunities:
  http://www.nsf.gov/funding/
Emerging Frontiers in Research and Innovation (EFRI)

- Supports higher-risk, higher-payoff opportunities that:
  - Are potentially transformative
  - Address a national need or grand challenge
- Topic areas for FY 2012 are:
  - Flexible Bioelectronics Systems (BioFlex)
  - Origami Design for the Integration of Self-assembling Systems for Engineering Innovation (ODISSEI)
  - Photosynthesis Biorefineries (PSBR)
- $31M investment for 4-year awards at ~$500K per year
- Letters of Intent due Sept. 30, 2011; pre-proposals due Nov. 9; invited full proposals due March 30, 2012
- www.nsf.gov/eng/efri
Grant Opportunities for Academic Liaison with Industry (GOALI)

• Effectively promotes the transfer of knowledge between academe and industry, student education, and the exchange of culture

• Supports:
  – Faculty and students in industry (≤ 1 year)
  – Industry engineers/scientists in academe (≤ 1 year)
  – Industry-university collaborative projects (≤ 3 years)

• $5M available for co-funding with all NSF Directorates

• Proposals accepted anytime; ~70 awards each year

ENG Contact
Don Senich
NSF-wide Education Programs

• Integrative Graduate Education and Research Traineeship (IGERT)
  – ~20 awards each year
  – Letters of Intent due May 1, full proposals due July 2, 2011

• Graduate Research Fellowships (GRF)
  – ~2000 fellowships awarded each year
  – Engineering and interdisciplinary proposals due in Nov. each year
Major Research Instrumentation (MRI) Program

- Goals of the program are to:
  - Support the acquisition or development of major state-of-the-art instrumentation
  - Improve access to and increase use of modern research and research training instrumentation
  - Enable the creation of well-equipped learning environments that integrate research with education
  - Foster the development of the next generation of instrumentation
  - Promote partnerships

- ~$90M investment for approximately 175 awards
- Proposals due Jan. 26, 2012
Other Collaborative and Interdisciplinary Research

• Interdisciplinary research (new CREATIV)
• Engineering Education and Centers
• Industrial Innovation and Partnerships
• Office of international Science and Engineering
• Others……..
Writing a Grant Proposal: (One) Reviewer’s Point of View

Farshid Guilak, Ph.D.
Laszlo Ormandy Professor

Departments of Orthopaedic Surgery, Biomedical Engineering, and Mechanical Engineering & Materials Science
Duke University Medical Center
There are 3 Rules for Writing the Perfect Grant Application

Unfortunately, no one knows what they are.

W. Somerset Maugham
But there are some guidelines that may improve your chances...

- Choose a research topic
- Decide on funding agencies and mechanism to pursue
- Write proposal with target audience in mind
  - Scientific review officer (SRO)
  - Reviewers
  - Program officer(s) and Council
Review Criteria

1. Significance - what is the overall impact of this work if it is successful?
2. Investigators - are you and your team qualified for this work?
3. Innovation - how novel are the goals and the techniques?
4. Approach - how will the work be performed?
5. Environment - are the physical facilities and colleagues conducive to the proposed work?

- Protection for Human Subjects
- Inclusion of Women, Minorities, Children
- Vertebrate Animals
# Review Scoring

<table>
<thead>
<tr>
<th>Impact</th>
<th>Score</th>
<th>Descriptor</th>
<th>Additional Guidance on Strengths/Weaknesses</th>
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<tr>
<td>High</td>
<td>1</td>
<td>Exceptional</td>
<td>Exceptionally strong with essentially no weaknesses</td>
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<tr>
<td></td>
<td>2</td>
<td>Outstanding</td>
<td>Extremely strong with negligible weaknesses</td>
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<td></td>
<td>3</td>
<td>Excellent</td>
<td>Very strong with only some minor weaknesses</td>
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<tr>
<td>Medium</td>
<td>4</td>
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<td>Strong but with numerous minor weaknesses</td>
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<td></td>
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<th>Additional Information for Scoring Guidance Table</th>
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<tr>
<td><strong>Non-numeric score options:</strong> NR = Not Recommended for Further Consideration, DF = Deferred, AB = Abstention, CF = Conflict, NP = Not Present, ND = Not Discussed</td>
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<tr>
<td><strong>Minor Weakness:</strong> An easily addressable weakness that does not substantially lessen impact</td>
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<tr>
<td><strong>Moderate Weakness:</strong> A weakness that lessens impact</td>
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<tr>
<td><strong>Major Weakness:</strong> A weakness that severely limits impact</td>
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What is the Most Important Part of an Application?
The Trick is to Map Your Writing onto the Review Criteria

1. Significance
2. Investigators
3. Innovation
4. Approach
5. Environment
   - Human Subjects
   - Women, Minorities, etc.
   - Vertebrate Animals

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**RESEARCH GRANT**

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</tr>
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<tr>
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<td>Budgets Pertaining to Consortium/Contractual Arrangements</td>
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<td>Biographical Sketch – Program Director/Principal Investigator (Not to exceed four pages each)</td>
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<tr>
<td>Other Biographical Sketches (Not to exceed four pages each – See instructions)</td>
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<tr>
<td>Resources</td>
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<tr>
<td>Checklist</td>
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<td>Research Plan</td>
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<tr>
<td>1. Introduction to Resubmission Application, if applicable, or Introduction to Revision Application, if applicable *</td>
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<td>2. Specific Aim *</td>
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<td>4. Inclusion Enrolment Report (Renewal or Revision applications only)</td>
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<td>5. Bibliography and References Cited/Progress Report Publication List</td>
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<td>11. Select Agent Research</td>
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<td>12. Multiple PD/PI Leadership Plan</td>
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<td>14. Letters of Support (e.g., Consultants)</td>
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<td>15. Resource Sharing Plan (x)</td>
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<tr>
<td>Appendix <em>(Five identical CDs.)</em></td>
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* Follow the page limits for these sections indicated in the application instructions, unless the Funding Opportunity Announcement specifies otherwise.
Before You Start Writing

- Plan - It can take 3-6 months to write a grant application
- Check with your business office to see what deadlines it has
- Documentation for budgets, animals, or human subjects.
- Contact collaborators, consultants, and internal reviewers.
Two Main Types of Bioengineering Grants

• Hypothesis-Driven
  – Answer specific questions (hypotheses)
  – Mechanism-based (engineering and/or biological)
  – Don’t just ask “if”, also ask “why”

• Technology-Driven
  – Biomaterials, devices, bioreactors, TE/RM
  – Innovation is important
  – Potential applications drive the significance and impact
  – What if it doesn’t work?
Don’t Propose Too Much

• Focus your application. New applicants often overshoot their mark, proposing too much. Make sure the scale of your hypothesis and aims fits your request of time and resources.

• Reviewers will quickly pick up on how well matched these elements are.
These Categories Don’t Directly Determine Your Score

- Reviewers are told to keep the five criteria in mind, yet the final priority score is more likely to reflect a judgment of overall merit.
- There is not a one-to-one relationship between the individual review criteria and your score.
- Writing a cohesive high-quality application with a persuasive argument for why you should be funded to do the work is the route to strong score.
Who are the Reviewers?

• Peers with expertise in the area of your proposal (sometimes more or less specific)
• Busy and overcommitted
• Could be reviewing 6-12 applications at once
• Almost always well-meaning
• Have a very difficult job of separating the top ~10%

• Their job is to assess the strengths and weaknesses of your proposal
What is Going Through the Reviewer’s Mind?

- Is the topic interesting and important?
- Is the science novel and correct?
- Are the investigators qualified?
- Why isn’t the WiFi working?
- How soon can I get out of here to catch my flight?
- Did you notice everyone on the other side has a Mac?

http://nihrecord.od.nih.gov
Write to Your Audience

• The primary, secondary, and discussants are usually the only ones who have read your grant.

• The majority of reviewers probably will not be familiar with your techniques or field.

• Your objective is to write and organize your application so the primary reviewers can readily grasp and explain what you are proposing.

• Some reviewers are much more persuasive than others and can influence the scoring of the panel.

• Each reviewer gets one equal vote.
Write to Your Audience

• Who is going to review your application?

• http://www.csr.nih.gov/committees/rosterindex.asp

• How does info help you?
  – Put yourself in their position.
  – Have you read the literature and cited it?
  – Do you have competitors on the panel?
  – What would these reviewers be looking for?
Persuading the Reviewers

- Capture the reviewers' attention by making the case for why you should be funded.
  - Why testing your hypothesis/technology is worth funding
  - Why you are the person to do it
  - How your institution supports you to get it done
  - Write your application as if you were teaching your audience about it. The best grants are ones where the reviewer says “I really learned a lot about this field by reading this …”
One Reviewer’s Thought Process

• Read the title and abstract and personnel page to get a general idea of the proposal

• Carefully read the 1 page Specific Aims page.
  – By this point, the reviewer has a preliminary score in mind.
One Reviewer’s Thought Process

• Read the rest of the application to find support for your preliminary score
  – If you don’t like the application, you look for flaws to make your case
  – If you like the application, look for “sound bites” to make your case

• Every possible project has problems and limitations – can you write a grant that is exciting enough to overcome natural limitations?
Innovation: Too little or too much

- **Innovation** is tricky to factor into your proposal.
  
  – Study sections are inherently conservative and have little desire for risk. The reviewers want to know what the work and outcome are likely to be.
  
  – Beware of being far outside the mainstream of thought. If your proposal is highly innovative, you'll need to make a very strong case for challenging the existing paradigm.
  
  – You may be right but if you are too far ahead in your thinking, you may be too much of a risk to fund.
Innovation: Too little or too much

• To me, the best formula for innovation:
  – A highly novel idea or technique,
  – But it’s your idea or you are fairly uniquely suited to perform the technique.
  – You have a lot of preliminary data that shows it is feasible and worthwhile.
Make Life Easy for Reviewers

- Reviewers are overworked, have too many grants to review, are easily annoyed, and are looking for problems
  - Keep it short and simple. Start with basic ideas and move progressively to more complex ones.
  - Guide reviewers with graphics. A picture is worth a thousand words.
  - Perform the review for them. Give them the sound bites they need to support your case, including weaknesses and how you will address them.
  - Edit and proof. Sloppy grant implies sloppy science
Common Problems in Applications

- Don’t follow the rules or format
- No hypothesis or untestable
- Problem not important, insignificant health issue
- Work is descriptive, not mechanistic
- Proposal is driven by methodology - method in search of a problem
- Experiments do not answer hypothesis
- Trial-and-error approach
- Too little detail in the research plan to convince reviewers you know what you are doing
Common Problems in Applications

- Lack of proper control experiments
- Proposal lacking enough preliminary data or preliminary data do not support project's feasibility.
- Insufficient consideration of statistical needs
  - Analysis not defined
  - Insufficient power or no power analysis
- Unrealistically large request for funds
  - Insufficient experience for oversight and management of funds (i.e., first application requests $5 million)
  - Offensive requests (i.e., 3 postdocs to do what 1 should do)
Common Problems in Applications

- Lack of new or original ideas
- Lack of experience or collaborators in the essential methodology
- Diffuse, superficial, or unfocused research plan
- Lack of knowledge of published relevant work
- Inappropriate amount of work, usually too ambitious
- Experiments too dependent on early aims without backup plan
- Uncertainty concerning interpretation of data
- Uncertainly regarding future directions
What We Didn’t Talk About

- Where to apply? Matching your project to the right agency
  - Federal (NIH, NSF, DOD), Foundation, Industry

- What funding mechanism? Matching your Project to the right type of application (K99/R00, F32, R03, R21, R01)

- Cover letters

- How many grants to submit and how often?

- Revising your application and addressing review comments
Acknowledgments
NIH Peer Review Process

Jean D. Sipe, Ph.D.
Scientific Review Officer
Musculoskeletal Tissue Engineering Study Section

National Institutes of Health
U.S. Department of Health and Human Services
"Yeah, but good luck getting it peer-reviewed."
All Grant Applications Go to the NIH Center for Scientific Review (CSR)

- Receives all NIH applications
- Assigns them to Institutes/Centers (funding) and to CSR or institute review branch (scientific review)
- CSR reviews investigator initiated grant applications for scientific merit
Sample Application Number

1
R01
CA
987654
01
A1

New Application
Individual Research Grant
National Cancer Institute
Serial Number
Grant Support Year
Resubmission
A Window to Your Application: eRA Commons

eRA Commons is an online interface where a grant applicant can:

• Check submitted grant application for errors and warnings and view final image
• Track review assignment, view review outcomes (score, summary statements), find contact info
• Update Personal Profile to ensure Early Stage Investigator eligibility is in place
• Submit pre-award information (just in time)
• View Notice of Award and other key documents

And much more!

https://commons.era.nih.gov/commons/
CSR Assigns Applications to:

• **Funding Institutes or Centers** based on—
  0 Overall mission and guidelines of the Institute or Center
  0 Specific programmatic mandates and interests of the Institute or Center

• **CSR or Institute Review Groups** based on—
  0 CSR--investigator initiated
     -- multiple institute assignments, single study section
     -- specific review guidelines for each cluster of study sections known as Integrated Review Groups (IRG)
  0 Institute Review Branch--solicited, e.g., RFAs
     -- unique programs, institute mission specific
NIH PEER REVIEW PROCESS IS A DUAL SYSTEM

STUDY SECTIONS (biomedical community)
Evaluate Scientific Merit
Score Applications
Recommend Level & Duration of Support
DO NOT make funding decisions.

ADVISORY COUNCILS (NIH investigators, public)
Assess Quality of Scientific Review
Recommend Funding to Institute Director
Evaluate Program Priorities & Relevance
Advise Institute Policy & Strategy
CSR Peer Review – Fiscal Year 2010

- 88,000 applications received
- 61,000 applications reviewed
- 18,000 reviewers
- 240 Scientific Review Officers
- 1,600 review meetings
Divisions and Integrated Review Groups (IRGs)
Get Your Application to the Right Study Section!

- Review CSR Integrated Review Group and Scientific Review Group (Study Section) guidelines to identify a home for your application.

- Submit a Cover Letter!
Cover Letter

The cover letter should be used for a number of important purposes:

• Suggest Institute/Center assignment
• Suggest review assignment
• Identify individuals in conflict
• Identify areas of expertise needed to evaluate the application
• Discuss any special situations
• Required for an electronic changed/corrected submission

It is NOT appropriate to use the cover letter to suggest specific reviewers.
Scientific Review Officer

Designated Federal Official with overall responsibility for the review process

- Doctoral level scientist with expertise complementary to science reviewed in their study section.

- Legal responsibility for study section and management of review.

- Provides written (summary statement) reports to ICs for second review.
How Reviewers Are Selected for Study Section Service

- Demonstrated scientific expertise/research support
- Doctoral degree or equivalent
- Mature judgment
- Work effectively in a group context
- Breadth of perspective
- Impartiality
- Representation of women and minority scientists
- Geographic distribution
Where Do We Find Reviewers?

- CSR Registry for Volunteer Reviewers
- Successful applicants
- Recommendations from reviewers and NIH staff
- NIH RePORTER ([http://projectreporter.nih.gov/reporter.cfm](http://projectreporter.nih.gov/reporter.cfm))
- Internet
- Scientific conferences
Before the Study Section Meeting

• Each application is assigned to 3 or more reviewers 5-6 weeks in advance

• Reviewer assess each application by providing:
  ◦ A preliminary Overall Impact score
  ◦ Criterion Scores for each of the 5 Core Review Criteria using the 1 - 9 scale
  ◦ A written critique
Study Sections: The Meeting

- Each Study Section has ~15-30 members who are scientists, clinicians, engineers

- Study sections convene face-to-face or virtually (electronic) meetings

- About 60-100 applications are usually reviewed by each study section
Discussions Focus on the Best Applications

• Reviewers typically discuss about 50-60% of the applications

• The panel will discuss any application a reviewer wants to discuss
Your Career Stage Is Considered

- If you submit an R01 grant application
- If you are a New Investigator or Early Stage Investigator
- If NIH has correct info on your career stage
Review Criteria

- **Overall Impact**
  0 Assessment of the likelihood for the project to *exert a sustained, powerful influence on the research field(s) involved*

- **Core Review Criteria**
  0 Significance
  0 Investigator(s)
  0 Innovation
  0 Approach
  0 Environment

Review criteria each scored from 1-9
Additional Issues Can Affect Overall Impact Scores

- Protections for human subjects
- Inclusions of women, minorities, and children
- Appropriate use of vertebrate animals
- Management of biohazards
### NIH Scoring System

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**Minor weakness:** Easily addressable weakness that does not substantially lessen impact.

**Moderate Weakness:** Impact lessened.

**Major Weakness:** Impact severely limited.

**Overall impact score = panel average x 10.**

Most scores are then percentiled for comparison across review groups.
Advice to Applicants: What Reviewers Look for in Applications

• Focus on significance and impact
• Make it exciting
• Be very clear
• Do not assume too much
• Have realistic aims and timelines -- Don’t be too ambitious
• Be brief with things that everybody knows
• Note the study’s limitations
• Proofread the application
Common Problems in Applications

- Lack of new or original ideas
- Absence of an acceptable scientific rationale
- Lack of experience in the essential methodology
- Questionable reasoning in experimental approach
- Uncritical approach
- Diffuse, superficial, or unfocused research plan
- Lack of sufficient experimental detail
- Lack of knowledge of published relevant work
- Unrealistically large amount of work
- Uncertainty concerning future directions
Who Can Answer Your Questions?

Before You Submit Your Application

• A Program Officer at an NIH Institute or Center
• Scientific Review Officer

After You Submit

• Your Scientific Review Officer

After Your Review

• Your Assigned Program Officer

GrantsInfo: GrantsInfo@nih.gov – 301 435-0714
Beyond Peer Review:
The Role of Program Directors and Institutes

Joan McGowan, PhD
Director, Division of Musculoskeletal Diseases
National Institute of Arthritis and Musculoskeletal and Skin Diseases (NIAMS)
National Institutes of Health
Department of Health and Human Services

2nd BMES-SPRBM Conference on Cellular and Molecular Bioengineering
30th SPRBM Scientific Conference
January 4, 2012

This slide set is intended for presentation only and is not Section 508 Compliant.
If you need an accessible version please contact the NIAMS Office of Science Policy and Planning at 301-496-8271.
A Simple View of the NIH

- Grants Management (GMS)
- Extramural Research Program
- Intramural Research Program
- Scientific Program (PD/PO)
- Scientific Review (SRO)

For help with the business aspects – Listed on the eRA Commons link to your submitted application

For questions during the review – Listed on the eRA Commons link to your submitted application

About the scientific and technical aspects – Listed in FOA and IC’s programmatic descriptions
Who to Contact When?

Contact YOUR GRANTS OFFICE, or grant.gov, or NIH eRA Help for issues related to submission.

Contact PD/PO for IC scientific mission relevance of your research, and advice on grant mechanism, IRG selection and/or revision; and GMS for budget related issues.

Contact SRO for any review related issues such as changing IRG, sending in supplements, indicating conflicts etc.

Application in Peer Review

Contact PD/PO for revision and funding.

Once funded, contact PD/PO for scientific relevant issues and GMS for process and/or policy issues.
Who Makes Final Funding Decisions?

The Institute or Center Director

Taking the recommendations from the Council and Program Directors, consider the following factors:

- Scientific Merit
- Contribution to Institute Mission
- Program Balance
- Availability of Funds
How and When to Engage NIH Program Staff

- **Program**
  - Before application you can discuss the suitability of applying to one mechanism or another – which tool to use?
  - After review you can discuss your summary statement and the revision process
  - You can sometimes get another perspective on your scientific goals and your career
The NIH Toolbox

- Research Project Grants (R01, R03, R15, R21, R25, R34)
- Cooperative Agreements (U01)
- Research Career Awards (K01, K02, K08, K18, K23, K24, K25, K99/R00)
- Research Programs and Centers (P30, P50, P60)
- Training Programs (T32)
- Fellowships (F31, F32, F33)
- Conference and Scientific Meeting Grants (R13, U13)

http://www.niams.nih.gov/Funding/Funding_Opportunities/activity_codes.asp
## Training and Career Timetable

### Approx. Stage of Research Training and Development

- **GRADUATE/MEDICAL STUDENT**
  - Small Grant (R03)
  - RPG (R01)
  - Exploratory/Development Grant (R21)

- **POST DOCTORAL**
  - Pre-doctoral Institutional Training Grant (T32)
  - Pre-doctoral Individual NRSA (F31)
  - Pre-doctoral Individual MD/PhD NRSA (F30)

- **EARLY**
  - Postdoctoral Institutional Training Grant (T32)
  - Postdoctoral Individual NRSA (F32)

- **MIDDLE**
  - NIH Pathway to Independence Award (K99/R00)
  - Mentored Research Scientist Development Award (K01)
  - Mentored Clinical Scientist Development Award (K08)
  - Mentored Patient-Oriented RCDA (K23)
  - Mentored Quantitative RCDA (K25)

- **SENIOR**
  - Independent Scientist Award (K02)
  - Midcareer Investigator Award in Patient-Oriented Research (K24)
  - Senior Scientist Award (K05)

### Mechanism of Support

[http://grants2.nih.gov/training/careerdevelopmentawards.htm](http://grants2.nih.gov/training/careerdevelopmentawards.htm)
High Risk-High Reward Research
The NIH Common Fund has created four unique funding opportunities for scientists with exceptional creativity who propose highly innovative approaches to major contemporary challenges in biomedical research:

**NIH Director's Early Independence Award** supports exceptional investigators who wish to pursue independent research directly after completion of their terminal doctoral/research degree or clinical residency, thereby foregoing the traditional post-doctoral training period.

**NIH Director's New Innovator Award** addresses two important goals: stimulating highly innovative research and supporting promising new investigators.

**NIH Director's Pioneer Award** designed to support individual scientists of exceptional creativity who propose pioneering – and possibly transforming approaches – to major challenges in biomedical and behavioral research.

**NIH Director's Transformative Research Award** created specifically to support exceptionally innovative and/or unconventional research projects that have the potential to create or overturn fundamental paradigms.

http://commonfund.nih.gov/highrisk/
Program Director/Officer (PD/PO) Roles and Responsibilities

- **Scientific Public Face of the Government**
  Pre-application and post-review scientific contact; mediate interactions of government with the investigators/institutions

- **Responsible Steward of Public Funds**
  Monitor award and progress; ensure proper use of public fund

- **Scientist/Scholar in Residence**
  Follow biomedical development and report scientific advances; advise senior management and ensure scientific accuracy of any public statement

- **Scientific Portfolio Builder**
  Help to set/implement IC priorities; design/execute specific initiatives; make funding recommendations; and rationalize investments

- **Advocate for Science and Medicine in Areas of Expertise**
  Represent You/Inst/Public and facilitate communications

- **Internal Policy Advisor**
  Advise NIH senior management on specific policies and procedures and serve on trans-NIH or-agency committees/working groups
Make sure your first application is strong!

- Choose the right mechanism at the right time in your career for the right project.

- Before writing the application, find out as much as possible about the grants process. For NIH grants, these are readily accessible on the NIH website: http://cms.csr.nih.gov/PeerReviewMeetings/

- Have a draft of the full proposal critiqued at a formal meeting of your colleagues:
  - This should be done at least a month prior to the submission deadline
  - Encourage your colleagues to be frank and highly critical
  - This can be humbling, but the application will benefit greatly

- This is now ESSENTIAL - only one revision!!
Beginning with Applications Funded in 2010

• The A2 was no longer accepted

• NIH Goals
  – Get funding out quicker
  – Reducing the burden on applicants and reviewers
Inverse Relationship Between A0 and A1/A2 Funding Rate

Average time to award 90 weeks
Virtual A2 Applications

Don’t!

• If funding is not obtained by A1 version, it is not appropriate to submit “virtual A2.”

• Next version must have substantial changes in Specific Aims and Approach

• Greater change than for resubmission application; not just response to issues in Summary Statement

• Request for different review location or Institute/Center assignment not sufficient to constitute a new application.

NOT-OD-10-080
Distribution of Awards by Version

http://nexus.od.nih.gov/all/2011/03/24/early-data-on-the-a2-sunset/
It’s the same number of applications funded
Awards of new, unsolicited R01 grants to new NIH investigators
Investigators’ time-to-award. New, unsolicited R01 applications, by fiscal year of original A0 application
General Advice

• Build resiliency into your research even at early stages
  – Work on multiple projects with a central theme

• Don’t get locked into a narrow area or technique
  – Become the go-to person for something but keep adding and growing

• Build a collaborative network
  – Work on others grants and bring in expertise from diverse disciplines into your grants.

• Because you are going to have to be resilient, collaborative, agile and strategic to survive
Thank You!

The Musculoskeletal Team at NIAMS