Grantsmanship and Navigating through the NIH

Bill Parks, Lynn Schnapp
Center for Lung Biology
Department of Medicine, Pulmonary and Critical Care Medicine

John Amory
Department of Medicine, General Internal Medicine

Agenda

• The importance of grants
• The NIH
• Grants mechanisms for you
• Demographics and funding trends
• Grant preparation
• The grant review process
What’s the Big Deal with NIH Grants?

- The major source of research dollars in US
  - 2003: $27.1 billion
  - 2004: $28.0 billion (+3.1%)
  - 2005: $28.6 billion (+2.2%)
  - 2006: $28.6 billion (-0.2%)
  - 2007: $29.2 billion (+2.1%)
  - 2008: $29.2 billion (0%)
  - 2009: $30.4 billion (+4.1%)
  - 2010: $31.0 billion (+2%; +6.2%)
  - 2011: $32.2 billion (+3.8%)

- The gold standard of extramural funding
- Essential for advancement and promotion
  - Your salary support
- Major source of revenue for UW

Most important: **Indirect Costs:** $1 = $0.52
Top Recipients of Taxpayers Largesse 2007

- 2816 institutions/companies/organizations ranked
- Last Place with $1 each: New York City Technical College
  Stillman College, AL
  South Bank University, London
NIH Funds at UW

50% of Research Funds at UW Come from the NIH

2009

$1,150 - Total grants and contracts
$500 - NIH

NIH funding

$1 billion

$953.6 MILLION

BREAKDOWN OF FISCAL 2004 FUNDING

- National Institutes of Health $476.5 MILLION
- National Science Foundation $76.6 million
- Dept. of Defense $40.9 million
- Dept. of Education $48.9 million
- Dept. of Energy $20.2 million
- Other federal agencies $53.9 million
- Other Dept. of Health & Human Services $40.0 million
- Non-federal funds $196.7 million ($16.1 million from Washington state)
Most Research Funds Go to the SOM

<table>
<thead>
<tr>
<th>WHERE THE MONEY GOES AT UW</th>
<th>$460.4 MILLION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Medicine</td>
<td>$102.7</td>
</tr>
<tr>
<td>Arts and Sciences</td>
<td>$71</td>
</tr>
<tr>
<td>Engineering</td>
<td>$64.3</td>
</tr>
<tr>
<td>Public Health and Community Medicine</td>
<td>$55.3</td>
</tr>
<tr>
<td>Health Science Special Programs</td>
<td>$37.6</td>
</tr>
<tr>
<td>Other Special Programs</td>
<td>$35.6</td>
</tr>
<tr>
<td>Social Work</td>
<td>$29.1</td>
</tr>
<tr>
<td>Nursing</td>
<td>$19.1</td>
</tr>
<tr>
<td>Education</td>
<td>$13.1</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>$13</td>
</tr>
<tr>
<td>Dentistry</td>
<td>$12.9</td>
</tr>
<tr>
<td>Evans School of Public Affairs</td>
<td>$12.1</td>
</tr>
<tr>
<td>Office of Research</td>
<td>$9.5</td>
</tr>
<tr>
<td>Forest Resources</td>
<td>$8.7</td>
</tr>
<tr>
<td>Graduate School</td>
<td>$3.8</td>
</tr>
<tr>
<td>Architecture, Urban Planning</td>
<td>$2.6</td>
</tr>
<tr>
<td>Information School</td>
<td>$2</td>
</tr>
</tbody>
</table>

And funds are spent about equally between salaries and lab expenses.

SAMPLE OF UW RESEARCH PROJECTS

- **Genetics**: $4.9 million from NIH to study the genes of single-celled bugs that cause disease, Department of Biochemistry.
- **Alzheimer's**: $4.2 million from NIH to prevent Alzheimer's from causing dementia, Department of Psychiatry and Behavioral Sciences.
- **Technology**: $3.6 million from NSF for researching materials and devices related to information technology, Department of Chemistry.
- **AIDS**: $3.5 million from NIH to find a broad vaccine to protect against AIDS, Department of Pharmaceutics.
- **Wages for Hourly Employees**: $2.2 million from NIH to model HIV prevention and treatments in primates, Regional Primate Research Center.

Desperate for more data on UW Research Funding? Go here: [www.washington.edu/research/statistics.html](http://www.washington.edu/research/statistics.html)
With Inflation, Funding Value at UW has Decreased
The Bulk (~85%) of the NIH Budget Supports Extramural Research & Training

FY2011 President’s Budget Request
Total NIH Budget Authority
$32.2 Billion*

- Research Mgmt. & Support: 3.9%
- Training: 2.7%
- All Other: 5.5%
- Other Research (Including K Awards): 5.9%
- Research Centers: 9.9%
- R&D Contracts: 9.6%
- Intramural Research: 9.7%
- Research Project Grants: 52.9%
### Appropriations

#### National Institutes of Health

**FY 2011 President’s Budget Request** ($000s)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cancer</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cancer</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heart, Lung &amp; Blood</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NHLBI</td>
<td>3,014,873</td>
<td>762,594</td>
<td></td>
<td>3,095,812</td>
<td>3,187,516</td>
</tr>
<tr>
<td>NIDCR</td>
<td>402,531</td>
<td>101,819</td>
<td></td>
<td>413,076</td>
<td>423,511</td>
</tr>
<tr>
<td>NIDDK 1/</td>
<td>1,910,151</td>
<td>445,393</td>
<td></td>
<td>1,957,364</td>
<td>2,007,589</td>
</tr>
<tr>
<td>NINDS</td>
<td>1,592,851</td>
<td>402,912</td>
<td></td>
<td>1,635,721</td>
<td>1,681,333</td>
</tr>
<tr>
<td><strong>Diabetes, Digestive, Kidney</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Allergy &amp; Infectious Dis.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Neuro. Disorders &amp; Stroke</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIAID 4/</td>
<td>4,701,456</td>
<td>1,113,288</td>
<td></td>
<td>4,816,726</td>
<td>4,977,070</td>
</tr>
<tr>
<td>NIGMS</td>
<td>1,997,172</td>
<td>505,198</td>
<td></td>
<td>2,050,372</td>
<td>2,125,090</td>
</tr>
<tr>
<td>NCI/NIH</td>
<td>1,205,616</td>
<td>327,443</td>
<td></td>
<td>1,329,027</td>
<td>1,368,834</td>
</tr>
<tr>
<td>NEI</td>
<td>688,276</td>
<td>174,097</td>
<td></td>
<td>706,765</td>
<td>724,390</td>
</tr>
<tr>
<td>NIEHS</td>
<td>662,687</td>
<td>168,057</td>
<td></td>
<td>689,565</td>
<td>707,339</td>
</tr>
<tr>
<td>NIA</td>
<td>1,080,472</td>
<td>273,303</td>
<td></td>
<td>1,109,800</td>
<td>1,142,337</td>
</tr>
<tr>
<td><strong>Neuro. Disorders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Child Hlth. &amp; Human Dev.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Deafness &amp; Communication Disorders</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIDCD</td>
<td>407,125</td>
<td>102,984</td>
<td></td>
<td>418,587</td>
<td>429,007</td>
</tr>
<tr>
<td><strong>Research Resources</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NCRR</strong></td>
<td>1,226,000</td>
<td>1,610,888</td>
<td></td>
<td>1,288,519</td>
<td>1,308,741</td>
</tr>
<tr>
<td><strong>Office of the Director</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>OD</strong></td>
<td>1,247,232</td>
<td>1,336,837</td>
<td></td>
<td>1,177,020</td>
<td>1,220,476</td>
</tr>
<tr>
<td><strong>B&amp;F</strong></td>
<td>125,168</td>
<td>500,000</td>
<td></td>
<td>100,000</td>
<td>125,581</td>
</tr>
<tr>
<td><strong>Type 1 Diabetes</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Subtotal, Labor/HHS</strong></td>
<td>30,318,024</td>
<td>10,389,703</td>
<td></td>
<td>31,009,788</td>
<td>32,007,237</td>
</tr>
<tr>
<td><strong>Interior/Supplement Research Program</strong></td>
<td>78,074</td>
<td>19,297</td>
<td></td>
<td>79,212</td>
<td>81,763</td>
</tr>
<tr>
<td><strong>Total, NIH Discretionary B.A.</strong></td>
<td>30,396,098</td>
<td>10,400,000</td>
<td></td>
<td>31,089,000</td>
<td>32,089,000</td>
</tr>
<tr>
<td><strong>Type 1 Diabetes</strong></td>
<td>150,000</td>
<td>0</td>
<td></td>
<td>150,000</td>
<td>150,000</td>
</tr>
<tr>
<td><strong>Total, NIH Budget Authority</strong></td>
<td>30,546,098</td>
<td>10,400,000</td>
<td></td>
<td>31,239,000</td>
<td>32,239,000</td>
</tr>
<tr>
<td><strong>NLM Program Evaluation</strong></td>
<td>8,200</td>
<td>0</td>
<td></td>
<td>8,200</td>
<td>8,200</td>
</tr>
<tr>
<td><strong>Total, Prog. Level</strong></td>
<td>30,554,298</td>
<td>10,400,000</td>
<td></td>
<td>31,247,200</td>
<td>32,247,200</td>
</tr>
</tbody>
</table>
NIH Grew with Clinton and Fell with Bush

Change in NIH Appropriations, FY 1995 - 2007

Appropriations
Billions $

Percent Change

Fiscal Year


Period of Doubling

Post Doubling

1995 2005 2007
Growth Wasn’t That Great Anyway
More Applications + Flat Budget = Reduced Paylines
Award Mechanisms for You

Types

- **F: Training Awards** (8th of Apr, Aug, Dec)
  - F32 (NRSA) Several others
  - Salary support + ~$5K (which UW keeps)
  - 3 yrs
  - Funds for tuition, off-site training, others
  - [http://grants.nih.gov/training/F_files_nrsa.htm](http://grants.nih.gov/training/F_files_nrsa.htm)

- **K: Career Development Awards** (12th of Feb, Jun, Oct)
  - K01: Mentored Research Scientist
  - K08: Mentored Clinical Scientist
  - K23: Mentored Patient-Oriented Research
  - 75% effort ($75K cap on salary) + $25K supplies
  - K99/R00: Pathway to Independence
    - K: 2 yr, $90K/yr
    - R: 3 yr, $249K/yr
  - Several others

- **Loan Repayment**
  - You do the research. NIH will repay your student loans.
  - Up to $35000/yr

Eligibility and Restrictions

- **F: Training Awards**
  - 0-7 yrs post degree (MD, PhD, DDS, etc.)
  - US citizens, non-citizen nationals, permanent residents
  - Not renewable
  - Foreign training OK - with clear advantages & justification

- **K: Career Development Awards**
  - US citizens, non-citizen nationals, permanent residents
  - K01: PhD typically (differs markedly among institutes)
  - K08: Clinical degree: MD, MD/PhD, DO, DDS, PharmD, etc.
  - Strong evidence of institutional comment and training
  - [Institute-specific mechanisms, rules and restrictions](http://grants1.nih.gov/grants/guide/pa-files/PA-10-059.html)
  - K99/R00: no more than 5 yrs of postdoc training
  - K99/R00: no citizen restrictions

- **Loan Repayment**
  - US citizens, non-citizen nationals, permanent residents
  - Doctoral degree
  - Educational debt ≥ 20% base salary
  - Conducting government-sponsored research
  - Several exclusions
UW’s KL2 Program

- Multidisciplinary Clinical Research Career Development Program

- Provide training in clinical and translational research in one of the following 3 broad areas:
  1. Translational Research
  2. Clinical Trials
  3. Outcomes/Clinical Epidemiology/ Health Services Research

- You get a title: *Clinical Research Scholar*

- Many scholars will complete an MS degree in Public Health or Pharmacy

- 4-5 years of salary support (75% time), up to $85,000 yearly plus $25,000/yr research funds

- 5-6 scholars chosen yearly by Dec (28-24 total scholars). Applications due in fall.

- Weekly research seminars and “works-in-progress” sessions

- Details at: [http://www.iths.org/education/kl2](http://www.iths.org/education/kl2)
UW’s KL2 Program: Eligibility

- US citizens, non-citizen nationals, permanent residents
- Postdocs or early junior faculty from just about anywhere
- Clinical doctorate or PhD (or equivalent)
  - Clinical doctorate degrees: MD, DrPH, DO, DDS, DMD, OD, DC, PharmD, PsyD, and ND (Doctor of Naturopathy)
  - Epidemiologists, behavioral scientists, and nurses with doctoral degrees
- No prior NIH funding as a PI, including K-series, R01, others
  - Training grants OK (e.g., F32, T32)
  - Small grants OK (e.g, R21, R03)
- Cannot simultaneously submit or have pending an application for other PHS mentored career development award (e.g., K07, K08, K22, K23) that duplicates any of the provisions of the KL2 program.
- Must commit 75% effort (unless if you’re a surgeon)
- Details at: http://www.iths.org/education/kl2/eligibility
UW’s KL2 Program: More

- 2 mentors
- Organized, monthly/bimonthly meetings with mentors
- Share office space with other Scholars
- FAQ at: http://www.iths.org/education/kl2/faq
Success Rate of F32 (NRSA) Applications

Similar for MDs and PhDs
NRSAs by Institutes - 2007
Good Odds with Entry Level Career Awards

2009 Success Rates

- K01: Mentored Research Scientist 38%
- K08: Mentored Clinical Scientist 47%
- K23: Mentored Patient-Oriented Research 44%
- K25: Mentored Quantitative Research Development 22%
- K99: Pathway to Independence 29%

All Ks 38%
### NIH K99 Awardees: 2007-2009

<table>
<thead>
<tr>
<th>Number</th>
<th>204</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Degree (% of total)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PhD</td>
<td>91.2</td>
</tr>
<tr>
<td>MD</td>
<td>2.0</td>
</tr>
<tr>
<td>MD/PhD</td>
<td>6.4</td>
</tr>
<tr>
<td>Other</td>
<td>0.5</td>
</tr>
</tbody>
</table>

| Proposing Human Subjects Research (%) | 24.5 |

<table>
<thead>
<tr>
<th>Citizenship (% of total)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>U.S. Citizen</td>
<td>59.8</td>
</tr>
<tr>
<td>Permanent Resident</td>
<td>13.7</td>
</tr>
<tr>
<td>Non-citizen</td>
<td>26.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender (% of total)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>57.4</td>
</tr>
<tr>
<td>Female</td>
<td>39.2</td>
</tr>
<tr>
<td>Unreported/Unknown</td>
<td>3.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race/Ethnicity (% of total)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>45.6</td>
</tr>
<tr>
<td>Asian</td>
<td>19.1</td>
</tr>
<tr>
<td>Underrepresented Minority</td>
<td>8.8</td>
</tr>
<tr>
<td>Unreported/Unknown</td>
<td>36.3</td>
</tr>
</tbody>
</table>
### Success of Training Programs - NHLBI

<table>
<thead>
<tr>
<th>Training Support</th>
<th>Number Awarded</th>
<th>Applied for Other Support</th>
<th>Dropped Out</th>
<th>K Award</th>
<th>R01s and Other RPGs</th>
</tr>
</thead>
<tbody>
<tr>
<td>T32 (1997)</td>
<td>217</td>
<td>111 (51%)</td>
<td>106 (49%)</td>
<td>67 (31%)</td>
<td>75 (35%)</td>
</tr>
<tr>
<td></td>
<td>61% MD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>36% PhD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K08 (2000)</td>
<td>104</td>
<td>82 (79%)</td>
<td>22 (21%)</td>
<td>60 (58%)</td>
<td></td>
</tr>
</tbody>
</table>

- 51% of postdoctoral T32 trainees apply for an NIH grant within 10 years
- 35% of postdoctoral T32 trainees receive one or more awards
- 79% of K08 awardees apply for a NIH grant within 10 years
- 58% of K08 awardees receive one or more awards
- About the same for K23 awardees
- NIH-wide data for Ks: 75% apply, 50% receive
Whose Getting the Grants?

Middle-age to Old Male PhDs in Basic Science Departments
NIH Applications and Success Rate by Degree

The graph illustrates the trend of NIH applications and success rates by degree type from 1970 to 2000. The y-axis represents the success rate (percent), while the x-axis shows the years from 1970 to 2000. The data is divided into categories: All M.D.'s, Ph.D. Only, M.D. Success Rate, and Ph.D. Success Rate. The graph shows a general increase in applications and success rates over the years, with fluctuations observed throughout the period.
Gender Data
Same Success Rates for Women and Men
But Women Get Slightly Bigger Grants
Average Age of R-series Awardees

Average Age of All Investigators:
- 1970: 40.9
- 2005: 51.7

Average Age of New Investigators:
- 1970: 35.2
- 2005: 42.9
A Country for Old Men (and Women)

*R-series Grants by Age of PI*
Average Age at Time of Appointment to Assistant Professor at US Medical Schools
Get a Grant and Retire

<table>
<thead>
<tr>
<th>Year</th>
<th>Total NIH PIs Number</th>
<th>Average Age</th>
<th>New NIH PIs Number</th>
<th>Average Age</th>
<th>Number of Medical School Faculty Positions</th>
<th>Average Age of Medical School Faculty</th>
<th>Average Age of First time Assistant Prof.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>14,887</td>
<td>39.1</td>
<td>1,843</td>
<td>37.2</td>
<td>53,552</td>
<td>43.1</td>
<td>33.9</td>
</tr>
<tr>
<td>1998</td>
<td>17,761</td>
<td>42.7</td>
<td>1,355</td>
<td>39.0</td>
<td>73,413</td>
<td>45.2</td>
<td>35.4</td>
</tr>
<tr>
<td>2006</td>
<td>25,419</td>
<td>50.8</td>
<td>1,346</td>
<td>42.4</td>
<td>121,468</td>
<td>48.7</td>
<td>37.7</td>
</tr>
</tbody>
</table>
Need to Fund More Young Investigators
Early Stage Investigators

- Not previously a PI on any PHS-supported research project
  
  **Exceptions**
  - Small R-series (R03, R15, R21)
  - Mentored and nonmentored K awards

- Early Stage Investigators (ESI)
  - Within 10 years of completing terminal research degree
  - Within 10 years of completing medical residency (or the equivalent)
  - Extensions: injury, birth

- Breaks for ESIs
  - Separate payline 5 points higher (Band 1)
  - Fund all years requested
  - Expedited review if missed elevated payline by 5 points or less (i.e., >5 - ≤10) (Band 2)
  - 1\textsuperscript{st} competitive renewal: payline 5 points higher

- **Applies to R01 applications only**

Tip: Apply for an R01 as soon as you can.
Its Getting a Little Better
Success Rates: New vs. Established

<table>
<thead>
<tr>
<th>Previous Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHLBI Total ESI 2006-2009</td>
</tr>
<tr>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td>MD</td>
</tr>
<tr>
<td>PhD</td>
</tr>
</tbody>
</table>

NHLBI
Total ESI
2006-2009
NRSA
K Award
R03 or R21
Co-PI on an R01

MD
115
56%
35%
15%
41%

PhD
79
35%
10%

Success Rate (%)
Grant Preparation

- Read other applications, esp. successful applications
- Seek advice and input
- Be scholarly
- Be fastidious
- Guide your readers by the hand

Useful sites for planning:
- Lots of info and links: [http://grants1.nih.gov/grants/oer.htm](http://grants1.nih.gov/grants/oer.htm)
- NIH Forms: [http://grants.nih.gov/grants/forms.htm](http://grants.nih.gov/grants/forms.htm)
- Due Dates: [http://grants1.nih.gov/grants/funding/submissionschedule.htm](http://grants1.nih.gov/grants/funding/submissionschedule.htm)

RePORT (Research Portfolio Online Reporting Tools)
- Database of all NIH grants, success rates, and much more
- Know your competition ([http://projectreporter.nih.gov/reporter.cfm](http://projectreporter.nih.gov/reporter.cfm))
Plan Ahead - K08 Deadline Feb 12, 2011

- Sep 2010: Think, advice, preliminary data, manuscripts
- Nov 2010: Download forms, write, seek advice, get feedback, rewrite
- Dec 2010: Admin stuff: Budgets, letters, etc.
  Submit near-completed draft for routing/approval
- Jan: Send to UW Office of Research
- Feb-Mar: Sorted by CSR
  - Assigned an unique number: K08-HL102201-01
  - Assigned to a Study Section
- Mar: Reviewers picked and assigned by SRA
- Apr: Reviewers download application
- Jun: Study section meets
- Jun: Scores uploaded to eRA Commons
- Jul: Summary statement uploaded
- Jul: Institute Council
- Jul-Sep: Just-in-Time materials
- Sep: Funding begins or resubmit (now: K08-HL102201-01A1)

- Nov: Resubmit
- May 2012: Funded
NIH Grant Numbers

1 K08 HL102201-01A1

Type Code
- Indicates whether the application is new, a renewal, noncompeting, or other type

Activity Code
- Lists the type of grant

Institute Code
- Two-letter code for the name of the NIH Institute or Center

Serial Number
- Unique 5-6 digit number that identifies the specific application
- Assigned by the CSR

Support Year
- Indicates the current year of support
- E.g., 01 is a new grant

Suffix Code (Optional)
- Used for supplements, amendments, or fellowship institutional allowances
Timeline for Preparing an application for Grants.gov

Now
- Download PureEdge
- Attend OSP Grants.gov training
- Attend SAGE file upload training
- Subscribe to Grants e-news
- Register with eRA Commons (NIH only)

8 Weeks Before
- Request letters of support
- Download application package

4 Weeks Before
- Finish collecting all biosketches
- Finish collecting letters of support
- Finish collecting sub-contracts

1 Week Before
- Finish research plan
- Withdraw application
- Change RTB button to “yes” (RTF button may change to ‘yes’ as soon as the application is ready to submit. There is no requirement to wait until 1 week before the deadline)

12 Weeks Before
- Write first draft of research plan

10 Weeks Before
- Start developing budget

6 Weeks Before
- Start collecting budget sub-contracts
- Finalize budget and personnel
- Submit human subjects/animal studies

3 Weeks Before
- Finish all forms
- Finish all except research plan
- Fill out eGC1 on line
- Attach draft application to eGC1
- Route for approvals

2 Weeks Before
- Write cover letter
- Submit to OSP

UW OSP, with lots of links to grant writing sites:
Grant Preparation - Things to do Well in Advance

- **Generate preliminary data**
  - Supports *all* hypotheses
  - Confirms feasibility
  - Not so critical for F32 (typically comes from the mentor)

- **Formulate your ideas**
  - Think
  - Testable hypothesis that advances a field

- **Publish a paper**
  - The importance of this cannot be stressed enough

- **Read successful applications!**

- **Mentoring**
  - Advisory committee
  - Seek advice

- **Enlist collaborators, consultants**
  - Special reagents, techniques, advice
  - Obtain letters
  - Evidence of enhanced training potential

- **Courses and Compliance (if and as needed)**
  - Research ethics
  - Biostatistics
  - Animal training & regulation, HIPAA, etc.
  - Specialized courses
Grant Preparation - Things to do before You Start Writing

• Take care of the administrative stuff
  • Budget and budget justification
  • Human, animal, biohazards approvals (Just in Time)
  • Resources

• Your statement, experience, transcripts

• Mentor’s statement

• Solicit letters of support (at least 3)

• Familiarize yourself with NIH forms
  • http://grants.nih.gov/grants/forms.htm

• Know the page limits for your application
  • http://enhancing-peer-review.nih.gov/page_limits.html
Grant Preparation - Some Advice

- Know the literature & be critical
  - Issues
  - Controversies
  - Unfounded dogma
  - What gaps will your work fill?

- Give yourself plenty of time

- Don’t submit until ready

- Know what Institute to target and what they are in interested in
  - RFA, Program announcements, etc.: http://www.grants.gov/
  - By Institutes: http://www.nih.gov/icd/

- Good video on some grant preparation tips: http://www.youtube.com/watch?v=lAOGtr0pM6Q
Tips and Pet Peeves

- **Keep the Personal Statement succinct**
  - Make clear when you started your time in the lab
  - *Do not follow the NIH example*

- **DO NOT** include abstracts as Publications

- **Publications**
  - Up-to-date (no “In press…since 2005”)
  - Complete citations, all authors
  - Name changed? Let us know.
  - Must match what we see online

- **Some leeway is OK**
  - OK to include manuscripts submitted and in preparation
  - OK to add another heading for abstracts (e.g., *Presentations*)

- **Important to show what you have done**
Specific Aims

• A dedicated page

• Introductory paragraphs
  • State purpose and importance
  • Concise summary of key findings
  • A clearly stated hypothesis: “I hypothesize that…”
    • Be clear and mechanistic
  • Relate how aims will address the big picture (long-term goals) and advance the field
  • List of aims (2, 3, or 4)

• Optional: a diagram or cartoon summarizing ideas and aims

• Importance for Reviewers
  • Many say this is the most important section
  • May be required reading for all Study Section members

• Pet Peeve
  • Obvious or tautological hypothesis:
    “…the cytoskeleton is important for cell structure.”
    “…poor outcomes mitigate the ability to actualize wellness potentials.”
Background and Significance

• Critically review the literature
  • No limit on number of citations
  • Original, timely papers over reviews
  • Do not be afraid to say you disagree with something (but explain why and how you will correct this travesty)
  • Question dogma
  • Limit discussion to things (pathways, diseases, molecules, etc.) you will study
  • Justify your overall experimental approaches and models
  • Provide graphics (cartoon, model, pathways, etc.)

• What are the gaps in our knowledge?

• What new information will your work provide?

• Don’t be shy
  • Use first-person pronouns (I, we)

• Show enthusiasm

• Know your audience
  • CSR database (see review section below)

Pet Peeves

• Too long
• Not timely or scholarly
• Reliance on reviews
• Strays from focus
• Unfettered enthusiasm
• Uses the word “exciting” more than once or even just once
Preliminary Data

- Summarize relevant experience and contributions
- OK to use data from mentor’s lab
- Provide interesting data
- Demonstrate your ability to do things
- Demonstrate feasibility of doing new things
- Critically interpret your data - say what it means
  - *Thus, these data indicate…*
  - *Do not expect your reviewers to make your conclusions!*
- Make figures clear
- Number the figures
- Embed figures near text
- Include legends (but not overly detailed)
- Do not rely on materials in the appendix

Pet Peeves

- Not crediting data you did not generate to its rightful source
- No figure numbers, titles, or legends
- Little figures are hard to see
- Figures a page or two away from the text
- No conclusions
- No link to the Aims
• This is the meat
• More narrative than technical
• For each aim, provide:
  • Rationale
  • Approach
  • Experiments
  • Expected results and interpretation
  • Potential pitfalls and alternative strategies
  • Future directions (short)
• Quantification and statistics
• Methods
  • Justify selection of techniques
  • Detailed methods are boring, but…
  • Give priority to new or difficult methods
  • Kit Rule
• Priorities and time line
  • For some reason, reviewers like these

### Pet Peeves

- No logical flow from aim to aim
- Aims dependent on preceding aim
- Overly detailed methods
- Overly ambitious
- Not focused
- No discussion on expected findings, interpretation, pitfalls, etc.
- No letters from collaborators and consultants

<table>
<thead>
<tr>
<th>Aim</th>
<th>Description</th>
<th>YR 1</th>
<th>YR 2</th>
<th>YR 3</th>
<th>YR 4</th>
<th>YR 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1A</td>
<td>Role of matrix in ischemia-reperfusion repair</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1B</td>
<td>Neutrophil activation in vivo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2A</td>
<td>Neutrophil binding to KC/syndecan-1 complexes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2B</td>
<td>Requirement of syndecan-1 shedding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2C</td>
<td>Syndecan-1 association with integrins</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3A</td>
<td>Binding sites of KC/syndecan-1 interaction</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3B</td>
<td>Neutrophil activation with disrupted KC/syndecan-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3C</td>
<td>Inhibit KC/syndecan-1 interaction in vivo</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table IV. Timetable

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>5h RNA knockouts</td>
<td>In vivo experiments</td>
<td>Breeding L-6/SOD mice</td>
<td>Characterization and in vivo experiments</td>
</tr>
<tr>
<td>Breeding L-6/SOD mice</td>
<td>In vivo experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Immune cell depletion studies</td>
<td>In vivo mechanism experiments</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soluble gp130 in vivo experiments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Conditional expression studies; breeding</td>
<td>Results evaluation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Specific Aim 1</th>
<th>Specific Aim 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breeding L-6/SOD mice</td>
<td>Breeding L-6/SOD mice</td>
</tr>
<tr>
<td>Characterization and in vivo experiments</td>
<td>Results evaluation</td>
</tr>
<tr>
<td>Conditional expression studies; breeding</td>
<td>In vivo experiments</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Other Sections

- Bibliography and References
- Human Subjects
  - Inclusion of Women and Minorities
  - Targeted/Planned Enrollment Table
  - Inclusion of Children
- Vertebrate Animals
  1. Description of the proposed use of animals
  2. Justification of Animal Use
  3. Veterinary Care
  4. Procedures for Avoiding Pain and Discomfort
  5. Biohazard concerns
- Select Agent Research
  - Bad bugs
- Consortium/Contractual Agreements
  - Subcontracts (rare for F’s and K’s)
- Letters of Support
- Resource Sharing Plan
  - Generating new mice, datasets, others

Pet Peeves & Tips
- All required sections are not addressed
- Incomplete references
  - List all authors and title
- References do not match citations
  - Use EndNote, Bookends, etc.
- Animal numbers are poorly or not justified
Presentation and Style

- Clean, concise English
  - Grammar and syntax
  - Active vs. passive voice
  - Avoid pleonasms: “…has been shown to…”
  - *Read: Strunk and White, The Elements of Style*
  - *Read: Robert A. Day, How to Write and Publish a Scientific Paper*

- Paragraphs and spaces
  - Don’t make it look dense or cluttered
  - Fonts, margins (all 0.5 in), etc.
  - No headers or footers (except for paper submissions)

- Use some system (bold, underline, numbers) to indicate sections and subsections

- Flow
  - Logical transitions from sentence to sentence, paragraph to paragraph
  - Do the work for your reader
Presentation and Style

• Zero tolerance for typos
• Figures should be self explanatory
  • Legends
  • Label the X and Y axes
  • Point to or demarcate key features
• Avoid excessive abbreviations
• Avoid vague terms: e.g., ‘affects’, ‘influences’
• Take the reviewer by the hand
  • Don’t make them think
  • Don’t require them to look elsewhere for information
• Look at successful applications
How are NIH Grants Reviewed and Evaluated

Study Sections
CSR: Center for Scientific Review

- Receives, assigns and reviews
- ~70-80,000/yr
- 240 SRA (Scientific Review Administrators)
- ~16,000 reviewers per year
- >220 Study Sections/Special Emphasis panels
- 1,600 grant review meetings/yr
- CSR has no funding authority
Study Sections

• Organized into IRGs (Integrative Review Groups)

• 12-24 members, essentially all from academia
  • Plus about another 12+ ad hoc reviewers

• 60-100+ applications per meeting
  • ~12 per member
  • 3 reviewers per applications

• Information from CSR web site: http://cms.csr.nih.gov/
  • Study section scope
  • Roster of reviewers
  • Policies
  • Schedules

• Study sections are advisory - they do not fund applications.

• The “F Word”
Beginnings of Peer Review of Grants

- **1879**: Response to Yellow Fever
  - $30,000 bid from the US Army for universities

- **1940**: Need for Penicillin
  - President Roosevelt set up the National Defense Research Committee.
  - Awarded contracts for rapid production projects
  - Identified 700 universities for future contracts
  - 21 penicillin production plants
  - Led to a 97% survival rate for wounded soldiers

- **1942**: Medical Research funding grew from $2.3 million to $7.5 million
  - Rating applications with an “A”, “B”, or “C”
1946: The Fundamental Tenets for NIH

1. The only possible source for adequate support of our medical research is the taxing power of the federal government.

2. The federal government and politicians must assure complete freedom for individual scientists in developing and conducting their research work.

3. Reviews should be conducted by outside experts essentially without compensation.

4. Program management and review functions should be separated.
1946
The First NIH Study Section

An NIH Study Section Today
Most Reviewers are Established Investigators

Academic Rank of All CSR Reviewers

- **Professor**
- **Associate Professor**
- **Assistant Professor**

Most Reviewers are Established Investigators.
Review Process - Before the Meeting

- All done via the internet
- Applications made available to reviewer 6-8 weeks before the meeting (eCD)
  - 3 reviewers/application
  - 1°, 2°, and 3°
  - Occasion input from others
- Training grants (Fs, Ks)
  - Reviewers typically review applications on a wide range of topics
  - Unlikely to be an expert in all applications assigned
- Scores and critiques are uploaded 1 week before study section
- Each criterion is given a score (1, 2, 3…9)
- Each reviewer gives each application an overall Impact Score
  - Impact Score is not the mean of the criteria scores
  - Impact score is key
- Scores and critiques become available to all committee members
- Applications are ranked in order of initial mean Impact Scores
- Lower 40-60% are streamlined (i.e., not discussed)
  - Any “triaged” application can be resurrected at the meeting for discussion for any reason
  - Applicants receive the critiques and individual criteria scores
  - Impact Score is not given
Where and When Do Reviewers Review Grant Applications?

- At home
  - Maybe in bed
  - Maybe watching *Law and Order* reruns (the good ones, with Chris Noth)
- On a plane (no internet)
- At the last minute - and thus a bunch in one sitting
- Hence, reviewers can be stressed, anxious, and not terribly sympathetic
- They may also lose interest
- *Thus, do not tick off the reviewers!*
The Review Process - at the Meeting

- Begin at 8 am EST (i.e., 5 am PST)
- Cramped room full of lap tops and several jet-lagged reviewers
- What happens?
  - Application is announced and conflicts identified
  - Chair asks the 3 reviewers to state their scores
  - A moment of silence: all committee members read Aims and Abstract pages (still in a trial phase)
  - Primary reviewer discusses strengths and weaknesses
  - Other reviewers concur or discuss differences
  - Discussion opens to the committee
  - Animal and Human Subjects are discussed
  - Reviewers restate their scores
  - A range is established, e.g., 2-5, 3-3
  - Chair asks if anyone plans to vote outside of the range
  - Committee posts scores online*
  - Discuss any budgets or administrative issues
  - Repeat with the next application in order
- 15-20 min per application (shorter is best)
- Go to 6-7 pm
- Bar, eat, bar, sleep
- Repeat next day

Adjectives Used
- Exceptional (1)
- Outstanding (2)
- Excellent (3)
- Very Good (4)
- Good (5)
- Satisfactory (6)
- Fair (7)
- Marginal (8)
- Poor (9)

*Final Impact Score is the mean of the online posted scores of the voting committee. Final scores are unknown to the committee (except the chair)
• Reviewers are humans; humans err

• Assigned reviewers have the most influence on scoring

• A passionate reviewer (pro or con) can influence the group

• Any committee member can vote outside of the “range”

• Final Impact Score is usually (~85% of the time) close to the initial impact score
  • Scores change >1 point on only 15% of grants
  • Rarely for ESI applications (less than 1%)

Good video of a mock Study Section
http://www.youtube.com/watch?v=HMO3HoLJuJY
### Review Criteria

**Individual Training F-series Grants**
- Overall Impact

**Review Criteria**
- Candidate
- Sponsor & training environment
- Research training proposal/plan
- Training potential

**Career Development K-series Grants**
- Overall Impact

**Review Criteria**
- Candidate
- Career development plan
  - Career goals and objectives
  - Plan to provide mentoring
- Mentor(s), consultants, collaborators
- Environment & Institutional commitment

**Investigator Initiated R-series Grants**
- Overall Impact

**Review Criteria**
- Significance
- Approach
- Innovation
- Investigator
- Environment
Considering the candidate's (and sponsor’s) qualifications and previous research experience, evaluate the proposed training experience as it relates to preparation for an independent research career.
Review Criteria - Candidate

• “Assess the candidate's potential to become an important contributor to biomedical or behavioral science”

• Many factors are weighed:
  • Extent and level of education:
    • Undergraduate or graduate degree(s)
    • Fields
    • Academic performance
    • Mentors and institutions
  • Postdoctoral research or clinical experience:
    • Mentors and institutions
    • Fields
    • Productivity (very important)
  • Awards and honors
  • Other relevant research experience and professional training
  • Reference letters
    • Very important
    • Relative ranking: top 1-2%, top 25%
  • Evidence of commitment to a career in research

• Clinical degreed candidates (MD, DVM, DDS, etc.) vs. PhDs
Review Criteria - Your Publications

Tips and Pet Peeves

• One of the most important factors
• An easy and objective way to distinguish among applicants
• Numbers do count
  • So does impact, but…
  • Numbers are objective, impact is not.
• First-author and joint-first-author papers count highest
• What’s online must match what’s in your biosketch
• Changed your name? Indicate it somehow*
• Complete citations. List all authors.
• Be up-to-date
• Abstracts ≠ Publications

*In 2007, I changed my name from S.J. Germanotta to L. Gaga.
• **Better to change fields or stay put?**
  
  - "Candidates may choose to remain in a scientific area related to their previous work or shift to an entirely new area of research…
  - …[regardless] the proposed training plan must augment the candidate's conceptual and/or experimental skills."
  
  - Should be driven by your interests and career goals
  - Good proposals tend to do well.

• **Better to move to another institution or stay put?**
  
  - Moving is always considered to be better than staying in the same environment
  - But some environments (like UW) are BIG
  - Diversity in training and experience is viewed as a big plus
Review Criteria - Sponsor and Training Potential

• “Assess the qualifications of the sponsor…”
  • Research expertise
  • Track record as a mentor
  • Reputation and standing
  • Overall productivity and impact of published work
  • Funding

• “Evaluate the proposed training program…”
  • Individually tailored to the applicant
  • More than just techniques
  • Didactic and career-enhancing activities
    • Courses, seminars, lab meetings, journal clubs, and scientific conferences
    • Research integrity
    • Opportunities to present and publish - with feedback
    • Opportunities and encouragement to write grants - with feedback
    • Opportunities to interact with other scientists
  • Advisory committee
    • Role of each member
    • Dates and agenda

• “Evaluate the environment of the host laboratory and the institution as to be conducive to successful postdoctoral training”
Review Criteria - Research Proposal

• General approach

• Respective contributions of the applicant and the sponsor

• Must have scientific merit, but emphasis is on training

• “Check for flaws so severe that they cast doubt on the applicant's or the sponsor's scientific judgment and qualifications or on whether such flawed research can serve as an appropriate vehicle for the candidate’s development.”

• Quite different from an R01
# SCORED REVIEW CRITERIA

## 1. Candidate

**Strengths**
- The scholastic performance of the candidate has improved from many Cs in his undergrad years to straight As in recent years.
- The clinical background of this applicant is adequate for this type of project. This provides assurance that the candidate will be directly involved in generating most of the expected data in this large cohort of patients.
- The letters of recommendations speak highly of his motivation, excellent thinking skills, and strong commitment and enthusiasm to starting the proposed project.

**Weaknesses**
- The candidate has no prior research experience; however, I do not see this as a significant weakness since he has just finished his residency.
- The candidate did not state clearly his career goals. These can only be deduced by reading the three letters of reference.

## 2. Sponsor and Training Environment

**Strengths**
- The sponsor has an outstanding track record in mentoring young scientists.
- The laboratory is productive with an average of three publications a year.
- The fact that there are 5 post-docs and 2 Assistant Professors will allow the applicant to have daily interactions with knowledgeable scientists.
- The applicant will have ample choice to attend pertinent seminars as suggested in the sponsor’s training plan.

**Weaknesses**
- It would have been better to perform the exercise tests on patients at the co-sponsor’s laboratory which is located in the hospital to save the hassle of daily commuting.
- Inclusion of an expert in exercise physiology will strengthen the mentoring team. The sponsors’ inexperience in exercise physiology is obvious as the 3-rest periods required with this type of exercise were not proposed.
New Scoring System

• **Criterion Score**
  • Whole numbers: 1-9
  • 1 (exceptional); 9 (um, well let’s just hope you never get a 9)
  • Given by reviewers but not discussed at study section
  • Provided in summary statement of all applications (discussed and not discussed)

• **Overall Impact Score**
  • Whole numbers: 1-9
  • Not the mean of the criteria scores
  • Different criteria are weighted by each reviewer
  • Each review recommends a score
  • All committee members score within the range
  • Can vote outside the range, but must state that you are doing so

• **Final Impact Score**
  • Mean of all scores x 10
  • 10 - 90
  • Percentiled against similar applications across 3 meetings

• **Payline**
  • Varies among institutes
  • [http://www.aecom.yu.edu/ogs/NIHInfo/paylines.htm](http://www.aecom.yu.edu/ogs/NIHInfo/paylines.htm)
<table>
<thead>
<tr>
<th>Score</th>
<th>Descriptor</th>
<th>Additional Guidance on Strengths/Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Exceptional</td>
<td>Exceptionally strong with essentially no weaknesses</td>
</tr>
<tr>
<td>2</td>
<td>Outstanding</td>
<td>Extremely strong with negligible weaknesses</td>
</tr>
<tr>
<td>3</td>
<td>Excellent</td>
<td>Very strong with only some minor weaknesses</td>
</tr>
<tr>
<td>4</td>
<td>Very Good</td>
<td>Strong but with numerous minor weaknesses</td>
</tr>
<tr>
<td>5</td>
<td>Good</td>
<td>Strong but with at least one moderate weakness</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory</td>
<td>Some strengths but also some moderate weaknesses</td>
</tr>
<tr>
<td>7</td>
<td>Fair</td>
<td>Some strengths but with at least one major weakness</td>
</tr>
<tr>
<td>8</td>
<td>Marginal</td>
<td>A few strengths and a few major weaknesses</td>
</tr>
<tr>
<td>9</td>
<td>Poor</td>
<td>Very few strengths and numerous major weaknesses</td>
</tr>
</tbody>
</table>

Minor Weakness: An easily addressable weakness that does not substantially lessen impact
Moderate Weakness: A weakness that lessens impact
Major Weakness: A weakness that severely limits impact
### Impact Score

<table>
<thead>
<tr>
<th>Impact</th>
<th>Score</th>
<th>Descriptor</th>
<th>Strengths/Weaknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Impact</td>
<td>1</td>
<td>Exceptional</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Outstanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Excellent</td>
<td></td>
</tr>
<tr>
<td>Moderate Impact</td>
<td>4</td>
<td>Very Good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>Good</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Satisfactory</td>
<td></td>
</tr>
<tr>
<td>Low Impact</td>
<td>7</td>
<td>Fair</td>
<td></td>
</tr>
<tr>
<td></td>
<td>8</td>
<td>Marginal</td>
<td></td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>Poor</td>
<td></td>
</tr>
</tbody>
</table>
New Scoring System

- Spread out scores over the range
- More equal distribution
Old vs New

Old

New

Cumulative Percent

Priority Score

0% 10% 20% 30% 40% 50% 60%

100 150 200 250 300 350 400

Priority Score

10 20 30 40 50 60 70 80 90
Top Reasons Why Grants Don’t Get Funded

1. Lack of new or original ideas.
2. Diffuse, superficial, or unfocused research plan.
3. Lack of knowledge of published, relevant work.
4. Lack of preliminary data and/or experience with essential methodologies.
5. Uncertainty concerning future directions (where will it lead?).
6. Questionable reasoning in experimental approach.
7. Absence of an acceptable scientific rationale.
8. Unrealistically large amount of work.
9. Poor training potential
Didn’t Make It

- Revised Application (A1)
  - One chance only
  - After that? CSR screening software
- Consider the critique (without emotion)
- Address concerns in an Introduction
  - 1 page before Specific Aims
  - Be agreeable but not obsequious
  - Be firm but not confrontational
- Do not re-submit until all is in order
- Seek advice

**Review of a Revised Application**

- Treated as new application
- Reviewers will likely not be the same
  - Maybe 1 or 2
  - But almost always at least 1-2 new reviewers
- Reviewers see the original critique (which includes your Abstract)
- Reviewers do not see the original (A0) application
- Payline for A1 applications is lower than for A0 applications