

Overview of the NIH Grant Application Process

<http://www.nih.gov>

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The National Institutes of Health

- [National Cancer Institute \(NCI\)](#)
- [National Eye Institute \(NEI\)](#)
- [National Heart, Lung, and Blood Institute \(NHLBI\)](#)
- [National Human Genome Research Institute \(NHGRI\)](#)
- [National Institute on Aging \(NIA\)](#)
- [National Institute on Alcohol Abuse and Alcoholism \(NIAAA\)](#)
- [National Institute of Allergy and Infectious Diseases \(NIAID\)](#)
- [National Institute of Arthritis and Musculoskeletal and Skin Diseases \(NIAMS\)](#)
- [National Institute of Biomedical Imaging and Bioengineering \(NIBIB\)](#)
- [National Institute of Child Health and Human Development \(NICHD\)](#)
- [National Institute on Deafness and Other Communication Disorders \(NIDCD\)](#)
- [National Institute of Dental and Craniofacial Research \(NIDCR\)](#)
- [National Institute of Diabetes and Digestive and Kidney Diseases \(NIDDK\)](#)
- [National Institute on Drug Abuse \(NIDA\)](#)
- [National Institute of Environmental Health Sciences \(NIEHS\)](#)
- [National Institute of General Medical Sciences \(NIGMS\)](#)
- [National Institute of Mental Health \(NIMH\)](#)
- [National Institute of Neurological Disorders and Stroke \(NINDS\)](#)
- [National Institute of Nursing Research \(NINR\)](#)
- [National Library of Medicine \(NLM\)](#)

<http://www.nih.gov/icd/>

Important things about planning...

- Learn what institutes exist and what they fund.
<http://www.nih.gov/icd/>
- Learn what special funding opportunities exist at each.
- Learn what each study section likes to see.
(Center for Scientific Review), <http://www.csr.nih.gov/>
- Learn who is on the study section.
<http://www.csr.nih.gov/Committees/rosterindex.asp>

Standard types of **extramural** grants at the NIH

- R series grants (RO1, RO3, R21, R33)
 - single investigator grants \$250,000 per year, 5 years
- K series grants (**KO1**, **K99**, K02, KO7, K22, **K25**)
 - post doctoral training grants
(<http://grants2.nih.gov/training/careerdevelopmentawards.htm>)
- Career award wizard – Finds the grant mechanisms you are eligible for... (<http://grants2.nih.gov/training/kwizard/index.htm>)
- **SBIR/STTR** grants
 - start a business for \$100, and apply for \$100,000!
(<http://grants2.nih.gov/grants/funding/sbir.htm>)

Special Opportunities for **Biomedical Engineering**

- **National Institute of Biomedical Imaging and Bioengineering (NIBIB)**

<http://dms.dartmouth.edu/arc/>

- K series grants – good if you have an experienced mentor
 - R21 grant applications – NIBIBs main funding mechanism
 - First time RO1 applications – the pity checkbox
 - Program project applications
 - COBRE programs
 - SBIR/STTR applications from businesses
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Important things about planning...

- Talk to the program officer (or at least email them)
 - Look for special funding opportunities (RFAs, RFP)
 - Talk to funded researchers about your idea
 - Read current funded proposal abstracts (CRISP database)
<http://crisp.cit.nih.gov/> (computer retrieval of Information on Scientific Projects)
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Intramural possibilities for Research at NIH

- Student summer research experience
- Pre-doctoral awards (Minority F31, etc)
- Post doctoral positions
- Special intramural/extramural opportunities
- Tenure track Research Scientist positions

(<http://www.training.nih.gov/>)

SBIR/STTR Grants at NIH

- All institutes support this mechanism
<http://grants1.nih.gov/grants/funding/sbir.htm>
 - Funding rate of SBIR program is near 15-20%
 - Funding rate of ROIs is near 8-10%
 - Funding is decided by scientific score first (good for scientists, bad for business people).
 - Funding is geographically distributed by congressional district
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NIH generally funds these things ...

- Mechanistic/Basic research
 - Hypothesis driven Specific Aims
 - Disease specific research (except NIBIB !!)
 - Teams of researchers
 - Experienced researchers
 - Translational research
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Suggestions for applications

- Ask to use the best resources at your institution (generally people are willing to help young investigators)
 - Find potential collaborators to complement your experience/knowledge
 - Collaborate with the best people in the world (i.e. USA). Just ask!
 - Define key consultants who have substantial NIH funding already.
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Some practical issues

- Plan to submit your grant at least 2 times !
(timeline is 8 months for 1 submission, 1.5 years for 2 submissions, etc...)
 - Never worry about having too much funding or overlapping funding. (The only real problem is having no funding!)
 - Apply for several grants
 - Collaborate with experienced investigators
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Peculiarities of NIH

- Each institute has different rules (but generally application forms are the same, PHS398 forms)
 - modular budgets (blocks of \$25,000 for your budget)
 - Animal/Human Approvals can now be done at the time of award
 - generally must be citizen or permanent resident for post-doctoral research grant funding, but this is not true for R21 & R01 funding.
 - requests for applications come out frequently
 - funding closely linked to strategic areas
 - NCI has largest budget
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Local institutional issues to deal with

- Animal approvals are done here at Dartmouth through the Institutional Committee for Animal Care and Use Committee (IACUC) through the ARC <http://dms.dartmouth.edu/arc/>
 - Human approvals are done through Dartmouth Internal Review Board (IRB) prior to grant application, committee for the protection of human subjects (CPHS) <http://www.dartmouth.edu/~cphs/>
 - grants and contracts reviews and approves all applications & requires 1 week minimum.
 - full budget may be required by Dartmouth office of sponsored projects, even if NIH only wants modular one
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Department of Defense funding

- Congressionally directed Medical Research Program at the DoD.
 - Breast Cancer, Prostate Cancer, Ovarian Cancer, Neurofibromatosis, Tuberous Sclerosis, Leukemia, Prion, Special Populations. (<http://cdmrp.army.mil/>)
 - predoctoral training (in some subjects) – fund Ph.D.s
 - postdoctoral training awards
 - exploration/concept award – any level, hot new ideas only!
 - new investigator award – only for new PIs
 - idea award – full grant appl for 3 years
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Case Example: RO1 application

**Title: Biophysical response to therapy monitored with
Near Infrared Tomography**

P.I.: Brian W. Pogue

(see grant handout)

Tumor therapies

- 1) Radiation**
- 2) Chemotherapy**
- 3) Photodynamic therapy**
- 4) Biological Therapies**

- 5) Combinations of these therapies**

RO1 Grant Application –

- Investigate MECHANISMS and potential TRANSLATION to CLINICAL Trial

- **Specific Aims :**

Aim 1. Build NIR spectroscopy system, calibrate and test in phantoms and in vivo

Aim 2. Measure baseline responses to (i) radiation, (ii) chemotherapy, (iii) photodynamic therapy.

Aim 3. Optimize the combination therapy of (i) cellular-targeting photodynamic therapy with radiation therapy, and (ii) vascular-targeting photodynamic therapy with chemotherapy.

Aim 4. Develop NIR tomography system for coupling into CT, to allow clinical translation.

RO1 Grant Application Contents (roughly)

- **Face page & abstract page**
 - **Budget** (2-3 pages)
 - **Biosketches** (4 pages each)
 - **Resources page**
 - **Response to the previous review** (3 pages)
 - **Research Plan** (25 pages)
 - A. Specific Aims
 - B. Background & Significance
 - C. Preliminary Data (or Project Update for renewals)
 - D. Research Design and Methods
 - **Animal/Human protocols**
 - **References**
 - **Checklist page** (dartmouth info here)
 - **Letters of support** from senior collaborators
 - **Appendix** (up to 10 publications)
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Team for RO1 Grant Application

Brian Pogue (Ph.D. Medical Physics) P.I. - 50% effort

Shudong Jiang (Ph.D. Optoelectronics) hardware development 75% effort

Bin Chen (Ph.D. Pharmacology), cell and tumor growth and treatments, 50% effort.

Tor D. Tosteson, Sc.D., (Professor of Biostatistics), design animal experiments and analysis, 5% effort.

Keith D. Paulsen, co-director of the Advanced Imaging Center at Dartmouth-Hitchcock Medical Center, co-director of the Numerical Methods Laboratory at Thayer, 5% overall effort.

Jack Hoopes (D.V.M., Ph.D.) veterinary pathologist, directly involved in all pathology analysis, 20% effort.

Consultants

Eugen Hug, head of Radiation Oncology, help interpret tumor treatment studies, and to facilitate the use of the linear accelerators or orthovoltage irradiator (as needed effort)

Tayyaba Hasan, Ph.D., external consultant, international expert in photodynamic therapy mechanisms

Equipment

Typical framework for NIH grants

- Biological or Technological hypothesis followed by specific aim(s)
 - A good formula to use in biomedical engineering, is to combine technological hypotheses and have them lead into biological hypotheses.
 - Scores between 100 and 300 are typically worth revising and resubmitting. Higher than 300 is generally bad news.
 - In a revised application, you can add 3 pages at the front addressing the revisions, and then add new things highlighting all the changes somehow.
 - Revised grants have a much better score & better chance of funding
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ASSIGNMENT for NEXT DAY

- Write a 1 page description of your research grant idea (single spaced)
 - ½ the page should be a large introduction to the overall problem and what you hypothesize should be done
 - ½ the pages should be your SPECIFIC AIMS of how you will analyze & solve the problem.
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