

RI-INBRE

GRANT WORKSHOP

MONDAY, AUGUST 3, 2009

ALUMNI ROOM, THE RYAN CENTER

UNIVERSITY OF RHODE ISLAND

KINGSTON, RI

1:00 – 1:40 PM *BALANCING TEACHING AND RESEARCH AT PUIs*

DR. MARY ALLEN, WELLESLEY COLLEGE

1:40 – 2:10 PM *COMPONENTS OF A SUCCESSFUL AREA GRANT*

DR. REBECCA SOMMER, BATES COLLEGE

2:10 – 2:40 PM *NSF-RUI: STRATEGIES AND TIPS FOR SUCCESS*

DR. VICKI CAMERON, ITHACA COLLEGE

2:40 – 4:00 PM *Q&A AND PANEL DISCUSSION*

MODERATED BY DR. BONGSUP CHO, UNIVERSITY OF RHODE ISLAND

HANDOUTS:

Dr. Mary Allen's Curriculum Vitae

Dr. Vicki Cameron's Curriculum Vitae

Dr. Rebecca Sommer's Curriculum Vitae

Suggested Websites from our Workshop Panelists

Successful AREA Grant Proposals in the Biological Sciences (Dr. Sommer)

Tips for Great Grant Writing

Need Help Interpreting the New Review Scores?

Understanding Your Peer Review Summary Statement

Abbreviated Biographical Sketch of Mary Mennes Allen

June 2009

Jean Glasscock Professor of Biological Sciences
Director of Biological Chemistry
Chair of Science Center Chairs
Wellesley College
Wellesley, MA 02481

(781) 283-3068; fax (781) 283-3642
Electronic mail: mallen@wellesley.edu

Education: B.S. in Chemistry, University of Wisconsin, Madison, 1960
M.S. in Sanitary Chemistry, University of Wisconsin, Madison, 1961
Ph.D. in Microbiology, University of California, Berkeley, 1966

Member: Sigma Xi, American Society for Microbiology, Phycological Society of America, Council on Undergraduate Research, AAAS

National and International Professional Activities:

AAAS Section G Nominating Committee 1974-77; Councilor 2001-2004; Committee on Council Affairs 2001-2003
ASM National General Microbiology Section: Nominating Committee 1972-73, 1974-75, 1988-89; Vice-Chairman of Section, 1976-77; Chairman of Section, 1977-78; Alternate Councilor, 1994-96; Councilor, 1996-98
Collegiate Research Association of Biologists (CRAB), Steering Committee, 1984-85; President, 1989-92
Council on Undergraduate Research (CUR), Councilor, 1985-; Biology Editor of CUR Newsletter, 1986-89; Co-editor Directory of Undergraduate Research at Predominantly Undergraduate Institutions (1st and 2nd Editions); President-Elect 1993-94, President 1994-95; Immediate Past President, 1995-96
Pew Science Advisory Committee 1986-98
NSF BIO Advisory Committee 1992-97
HHMI Undergraduate Science Education Advisory Panel, Chair 1997; 2002
Beckman Scholars Advisory Panel 2001, 2002, 2003
M. J. Murdock Charitable Trust Life Sciences Research Initiation Grants Panel 1998-
Editorial Board, Archives for Microbiology, 2002-

Honors:

Fellow of AAAS
Wellesley College Pinanski Prize for Excellence in Teaching, 1986
AAUW Florence Seibert Fellowship 1989-90
ASM Foundation for Microbiology Lecturer 1990-91
ASM Carski Foundation Distinguished Teaching Award 1995
Fellow of the Council on Undergraduate Research 2000

Research and Professional Experience:

Instructor to Full Professor of Biological Sciences, Wellesley College, Wellesley, MA, 1968-; William R. Kenan, Jr. Professor of Biological Sciences, Wellesley College, 1987-1990; Jean Glasscock Professor, Wellesley College, 1989-
Visiting Researcher in the Department of Biochemistry, Liverpool, England, 1975-76
Chair, Dept. of Biological Sciences, Wellesley College, Wellesley, MA 1980-82; 1997-01
Director, Biological Chemistry (Molecular Biology) Interdepartmental Major, Wellesley College, Wellesley, MA September 1977-80, 1984-88, 1991-96, 2002-

The Malcolm Moos Visiting Professor, Gray Freshwater Biological Institute, University of Minnesota, Summer 1983;
Visiting Researcher in the Department of Microbiology, Montana State University 1990,
University of Sevilla, Spain 1996-97, University of Oregon, 1996-97

Major Research Interests:

Microbial physiology, biochemistry, and ultrastructure. Nitrogen metabolism in cyanobacteria, Effect of stress on cyanobacteria.

Teaching Experience:

General bacteriology, General microbiology, Microbial physiology and biochemistry, Electron Microscopy, Virology, Sanitary chemistry, Cell biology, Cell physiology, Seminars on Control Mechanisms, on Microbial Structure and Function, on Microbial Stress Mechanisms, and on Biofilms.

Recent Professional Publications: (* = undergraduate student coauthors)

*Stewart, T.J., *Yau, J-H., Allen, M.M., Brabander, D.J., and Flynn, N.T. 2009. Impacts of calcium-alginate density on equilibrium and kinetics of lead(II) sorption onto hydrogel beads. *Colloid Polym Sci.* In Press.

Kolodny, N.H., *Bauer, D, *Bryce, K, *Klucevsek, K., *Lane, A., *Medeiros, L., *Mercer, W., *Moin, S., *Park, D., *Petersen, J., *Wright, J., *Yuen, C., Wolfson, A.J., and Allen, M.M. 2006. Effect of nitrogen source on cyanophycin synthesis in *Synechocystis* sp. strain PCC 6308. *J. Bacteriol.* 188:934-040.

Allen, M.M., *Yuen C, *Medeiros L, *Zizlsperger N, *Farooq M, Kolodny NH. 2005. Effects of light and chloramphenicol stress on incorporation of nitrogen into cyanophycin in *Synechocystis* sp. strain PCC 6308. *Biochim Biophys Acta.* 1725:241-6.

*Huang, J.J., Kolodny, N.H., *Redfearn, J.T. and Allen, M.M. 2002, The acid stress response of the cyanobacterium *Synechocystis* sp. strain PCC 6308. *Arch Microbiol* 177:486-493.

Wingard, L.L, Miller, S.R., Sellker, J.M.L., Stenn, E., Allen, M.M. and Wood, A. M. 2002. Cyanophycin production in a phycoerythrin-containing marine *Synechococcus* strain of unusual phylogenetic affinity. *App. Envir. Microbiol.* 68:1772-1777.

*Erickson, N.A., Kolodny, N.H., and Allen, M.M. 2001. A rapid and sensitive method for the analysis of cyanophycin. *Biochimica et Biophysica Acta* 1526:5-9.

Allen, M. M. 2000. The joys of doing research with undergraduates at a liberal arts college. *CUR Quarterly*, June, 158-160.

Suarez, C., Kohler, S.J., Allen, M.M. and Kolodny, N.H. 1999. NMR study of the metabolic ¹⁵N isotopic enrichment of cyanophycin synthesized by the cyanobacterium *Synechocystis* sp. strain PCC 6308. *Biochimica et Biophysica Acta* 1426:429-438.

Wolfson, A.J., Hall, M.L. and Allen, M.M. 1998. Introductory chemistry and biology taught as an interdisciplinary mini-cluster. *J. Chem Ed.* 75:737:739.

Recent Grant Support:

National Science Foundation, AIRE grant to Wellesley College, "From natural to social sciences: expanding opportunities for the integration of research and education." 1998-2003 (CoPI with NH Kolodny).

Beckman Scholars Program Project Director, 1998-2005, 2007-2010.

Wellesley College Brachman Hoffman Fellowship, 2001-2004; Wellesley College Staley Fellowship, 2008-2009.

National Institutes of Health AREA grant, "The effects of acidic pH on cyanobacteria." 2002-2006

Service on Important Wellesley College Committees:

Committee on Faculty Appointments, 1978-1981, 1988-89, 1990-92, 2007-09; Nominating Committee, 1977-78, 1981-82, 1983-86; Agenda Committee, 1992-95, 2002-5; Faculty Awards Committee, 1976-79; Lecture Policy Committee, 1969-72; Curriculum Committee, 1972-75; Board of Overseers, Wellesley College Center for Research on Women, 1979-82; Appeals Committee, 1985-87; Search Committee for the Dean of the College, 1985-86; Work Load Committee, 1987-88; Ad Hoc Committee on Department Chairs, 1996; Full Professor Merit Committee, 1989-2001 ; President's Advisory Council, 1999-2002; Task Force on the Sciences, 2008-2009

Biology Department Visiting Committees:

Bard, Bowdoin, Haverford, Roanoke, Colby-Sawyer, Lake Forest, Pomona, Macalester, Colby, Hope, Occidental, Moravian and Sweet Briar Colleges, University of the South, Drew University, University of Minnesota Duluth.

Biochemistry Visiting Committees:

Smith College

CURRICULUM VITAE
VICKI L. CAMERON

Dana Professor of Biology, Ithaca College
29 Field Sparrow Rd.
Hilton Head, SC 29926
843-715-2007
Cameron@ithaca.edu

Education:

B.A. 1969: Sociology, University of Illinois at Champaign-Urbana
Ph.D. 1986: Molecular, Cellular and Developmental Biology, University of Colorado-Boulder

Awards and Honors:

NSF-Illinois Heart Association Summer Science Student Award
National Merit Scholarship Letter of Commendation, 1965
Illinois State Scholarship, 1965-1969
James Scholar, University of Illinois, 1965-1966
NIH Pre-doctoral Trainee, University of Colorado, 1980-81, 1982-83, 1984-85
Recipient, Achievement Rewards for College Scientists Fellowship, 1982-85
Virginia Ramo Scholar, 1984-85
Ithaca College Excellence in Scholarship Award, 2000
Ithaca College Dana Professor of Natural Science/Mathematics 2003-2009

Membership in Professional Societies

Phi Kappa Phi National Honor Society
Sigma Xi, the Scientific Research Society
Council on Undergraduate Research (Councilor, Biology Division: 2000-2006)
American Association for the Advancement of Science
Genetics Society of America
American Society for Microbiology

Employment:

2003-2009 Charles A. Dana Professor of Natural Science/Mathematics, Ithaca College
2005 Visiting Professor, Harvard University
1999-present Professor and Chair (2001-2004) of Biology, Ithaca College, Ithaca, NY.
1985-1999 Assistant and Associate Professor, Ithaca College, Ithaca, NY.
1980-1985 Graduate Student, MCD Biology Department, University of Colorado, Boulder, CO.
1972-1980 Research Chemist, Biochemistry Department, University of Illinois, Urbana, IL.
1971-1972 Research Assistant, Dairy Biochemistry Department, University of Illinois, Urbana, IL.
1969-1971 Research Assistant, California College of Medicine, Microbiology Department, University of California, Irvine, CA.
1968-1969 Student Assistant, Sociology Department, University of Illinois, Urbana, IL.
1966-1968 Laboratory Assistant, Biochemistry Department, University of Illinois, Urbana, IL.
1965-1966 Student Assistant, University of Illinois, Biochemistry Department, Urbana, IL.

Funded Grants:

2003-2008 NSF-RUI, "Effect of Amino Acid Substitutions on the Production, Localization, Processing Stability, and Function of Subunit II of Cytochrome c Oxidase in Yeast."
1998-2003 NSF-RUI, A Genetic Analysis of the Function of Cytochrome Oxidase Subunits Encoded on Mitochondrial DNA in Yeast".

- 1994-1997** NSF-REU supplements, AStructure and Function of Subunit II of Cytochrome *c* Oxidase.≡
1994-1998 NSF-RUI, "Structure and Function of Subunit II of Cytochrome *c* Oxidase."
1993-1994 Keck Foundation, "Instrumentation for Cell and Molecular Biology and Biochemistry."
1991-1993 NSF-ILI, "Improvement and Enhancement of Laboratory Experimentation in General Genetics."
1989-1993 NSF-RUI, "Analysis of Revertants of a Yeast Mitochondrial Promoter Mutant."
1987-1989 Research Corporation, "Analysis of Sequences Controlling mRNA Production for a Mitochondrially Encoded Protein in Yeast."
1986-1987 Research Corporation, "Analysis of DNA Sequences Controlling mRNA Production for a Mitochondrially Encoded Protein in Yeast."
1986 NSF-CSIP, "Development of a New Laboratory Course in Recombinant DNA Techniques."

Professional Publications:

- Cameron, V. (2003). "Teaching Advanced Genetics Without Lectures". *Genetics*, **165**: 945-950.
- Machingo, Q., Mazourek, M. and Cameron, V. (2001). "Second-Site, Intragenic Alterations in the Gene Encoding Subunit II of Cytochrome *c* Oxidase from Yeast Can Suppress Two Different Missense Mutations." *Current Genetics*, **39**: 297-304.
- Mazourek, M., Torello, A.T., and Cameron, V. (1999). AAnalysis of Strains of *Saccharomyces cerevisiae* with Amino Acid Substitutions in the Cu_A Binding Region of Subunit II of Cytochrome *c* Oxidase.≡ *Current Genetics*, **36**: 249-255.
- Torello, A.T., Overholtzer, M.H., Cameron, V., Bonnefoy, N. and Fox, T.D. (1997). Deletion of the Leader Peptide of the Mitochondrially Encoded Precursor of *Saccharomyces cerevisiae* Cytochrome *c* Oxidase Subunit II. *Genetics*, **145**: 903-910.
- Overholtzer, M.H., Yakowec, P.S. and Cameron V. (1996) AThe Effect of Amino Acid Substitutions in the Conserved Aromatic Region of Subunit II of Cytochrome *c* Oxidase in *Saccharomyces cerevisiae*.≡ *J. Biol. Chem.*, **271**: 7719-7724.
- Poyton, R.O., Sevarino, K.A., McKee, E.E., Duhl, D.J.M., Cameron, V. and Goehring, B. (1996) "Export of Proteins from the Mitochondria." in *Advances in Molecular and Cell Biology, Vol. 19: Protein Targeting to Mitochondria*, ed. Bittar, E.E. JAI Press, Greenwich, CN., pp. 245-277.
- Wilson, T. M. and Cameron, V. (1994) Replacement of a Conserved Glycine Residue in Subunit II of Cytochrome *c* Oxidase Interferes with Protein Function. *Current Genetics*, **25**: 233-238.
- Cameron, V., Fox, T. D., and R. O. Poyton. (1989). Isolation and Characterization of a Yeast Strain Carrying a Mutation in the Mitochondrial Promoter for *COX2*. *J. Biol. Chem.*, **264**(23):13391-13394.
- McEwen, J., Cameron, V., and R. O. Poyton. (1985). Rapid Method for Isolation and Screening of Cytochrome Oxidase Deficient Mutants of *Saccharomyces cerevisiae*. *J. Bact.*, **161**: 831-835.
- Carey, J., Cameron, V., Krug, M., deHaseth, P., and O. C. Uhlenbeck. (1984). Failure of Translational Repression in the Phage f2 *op3* Mutant is Not Due to an Altered Coat protein-RNA Interaction, *J. Biol. Chem.*, **259**: 20-22.
- Carey, J., Cameron, V., deHaseth, P., and O. C. Uhlenbeck. (1983). Sequence Specific Interaction of R17 Coat Protein and its Ribonucleic Acid Binding Site. *Biochemistry*, **22**: 2601-2610.
- Cameron, V., D. Soltis, and O. C. Uhlenbeck. (1978). Polynucleotide Kinase from a T4 Mutant Which Lacks the 3'-Phosphatase Activity. *Nuc. Acids Res.*, **5**: 825-833.
- Cameron, V. and O. C. Uhlenbeck. (1977). 3'-Phosphatase Activity in T4 Polynucleotide Kinase. *Biochemistry*, **16**: 5120-5126.
- Uhlenbeck, O. C., and V. Cameron. (1977). Equimolar Addition of Oligoribonucleotides with T4 RNA Ligase. *Nuc. Acids Res.*, **4**: 85-89.
- Cameron, V. and O. C. Uhlenbeck. (1973). Removal of Y-37 from tRNA^{phe}-yeast Alters Oligomer Binding to Two Loops, *B.B.R.C.*, **50**: 635-640.

Program Reviews

2001- 2007 Biology Program Reviews: Quinnipiac University, Western Connecticut State University, Purdue Univ. at Calumet, Concordia College (MN), Oauchita Baptist University,
April 2001 Washington College (MD), SUNY-Geneseo, Marist College
Facilities Review, University of Nebraska at Kearney

Other Reviews

2007-present External Reviewer for INBRE Grant for the State of Rhode Island
Multiple years NSF Grant Proposal Reviews, NSF *ad hoc* study section member, NIH *ad hoc* study section member
2007 Review of manuscript for *Genetics*
Multiple years External Reviews for Tenure and Promotion
Multiple years Text Book Reviews: General Biology and Genetics

Presentations: (since 1995)

(includes those given both by research students and by the principal investigator)

National Conference on Undergraduate Research, Salisbury State Univ, Md., April 2008. **Erik Van Fleet**, **Martin Tomov** and Vicki Cameron. "Deletion of the Nuclear Gene *YME1* Stabilizes Mutant forms of *Cox2p*"

Regional Sigma Xi Meeting, Cornell University, April 2006. **Martin Tomov** and Vicki Cameron. "Stablization of Mutant Forms of *Cox2p* by Deletion of *YME1* and Overexpression of *PETIII*."

Undergraduate Research Symposium, University of Rochester, October 2002. **Shannon L. Werner** and Vicki Cameron. "The Localization of a Mutant *CoxII* Protein in *Saccharomyces cerevisiae*."

Undergraduate Research Symposium, University of Rochester, October 2002. **Elizabeth Pratico**, **Seamus Levine-Wilkenson**, and Vicki Cameron. "Characterization and Analysis of Mitochondrial Suppressors of a Site-Specific *cox2* Mutation in *Saccharomyces cerevisiae*."

Canisus College, Buffalo, NY, Sept. 2002. "Genetic and Biochemical Analysis of Mutations in the Gene for Subunit 2 of Cytochrome *c* Oxidase an Enzyme Essential for Electron Transport."

Binghamton University, Binghamton, NY, March 2001. "Effect of Leader Peptide Deletion on the Function of Subunit II of Cytochrome *c* Oxidase in Yeast."

Utica College, Utica, NY, Sept. 2001. "Analysis of a Mutation in the Subunit II of Cytochrome *c* Oxidase in Yeast Which Leads to Loss of Respiration and Protein Processing."

CUR Posters on the Hill, Washington, D.C., April 2000. **Quentin Machingo** and Vicki Cameron, □ Novel Mutations in a Subunit of Cytochrome *c* Oxidase in *Saccharomyces cerevisiae*. □

8th National Conference of the Council on Undergraduate Research, Wooster, Ohio, June 2000. "Designing Functional Undergraduate Research Facilities." Knox, C. and Cameron, V.

Association of American Colleges and Universities, Washington D.C., Jan. 2000. Howard Erlich and Vicki Cameron. □ Fostering Meaningful, Voluntary Program Review. □

Research Link 2000, Big Rapids, MI., Aug. 1999. Vicki Cameron and Marc Servetnick. □ Undergraduate Research in the Biology Department at Ithaca College.

American Society for Biochemistry and Molecular Biology, San Francisco, CA, May, 1999. **Quentin Machingo**, **Michael Mazourek**, and Vicki Cameron. AAnalysis of Alterations in Subunit II of Cytochrome *c* Oxidase in Yeast.≡

Rochester Academy of Sciences, Geneseo, NY, Nov. 1998. **Quentin Machingo**, **Michael Mazourek** and Vicki Cameron. AAnalysis of Alterations to Subunit II of Cytochrome *c* Oxidase.≡

National Yeast Genetics and Molecular Biology Meeting, Uni. Maryland, Aug. 1998. **Michael Mazourek** and Vicki Cameron. ASuppressors of a Mutation Adjacent to the Copper Binding Ligands in Subunit II

of Cytochrome *c* Oxidase.

National Conference on Undergraduate Research, Salisbury State University, April 1998. **Michael Mazourek** and Vicki Cameron. AAnalysis of Mutations in the Copper Binding Region in Subunit II of Cytochrome *c* Oxidase.≡

Twenty Second Annual Biological Sciences Research Symposium, Binghamton University, Nov. 1997. **Michael Mazourek** and Vicki Cameron. AAnalysis of Mutations Adjacent to the Copper Binding Ligands in Subunit II of Cytochrome *c* Oxidase.≡

Northeast Regional Yeast Meeting, Nov., 1996. **Tom Torello, Michael Overholtzer**, Vicki Cameron, Nathalie Bonnefoy and T.D. Fox. ADeletion of the Leader Peptide of the Mitochondrially Encoded Precursor of *Saccharomyces cerevisiae* Cytochrome *c* Oxidase Subunit II.≡

National Yeast Genetics and Molecular Biology Meeting, Aug., 1996. **Tom Torello, Michael Overholtzer**, Vicki Cameron, Nathalie Bonnefoy and T.D. Fox. ADeletion of the Leader Peptide on *COX2* is Required for Production of a Functional Protein.≡

National Conference on Undergraduate Research, Apr., 1996. **Michael Overholtzer** and Vicki Cameron. ASuppression of a 39 Base Pair Deletion in the Leader peptide Sequence of Subunit II of Cytochrome *c* oxidase by a Mitochondrial Rearrangement with Cytochrome *b*.≡

Twentieth Annual Biological Sciences Research Symposium, Binghamton University, Nov. 1995. **Michael Overholtzer** and Vicki Cameron. "Suppression of a 39 Base Pair Deletion in the Leader Peptide Sequence of Subunit II of Cytochrome *c* Oxidase by a Mitochondrial Gene Rearrangement with Cytochrome *b*

(names bold and underlined are Ithaca College Undergraduates)

Service Activities:

Multiple years Coordinator: Biology Departmental Program Reviews, Council on Undergraduate Research

2000-2006 Council on Undergraduate Research: Councilor, Biology Division

2001-2004 Chair, Biology Department

2002 Chair, Biology Department Workload Committee

2002-2005 Production of Biology Department Newsletters

2001-2002 Faculty Institutional Advancement Committee

1998-2000 Presidential Library Commission

1999 Panel Member for Tenure and Promotion Workshop.

1998-99 Member Biology Department Self-Study Team; coordinator of final document assembly.
Led the department self-study team.

1997-2000 Advisor to the Premedical Society

1997-2000 Member, Standing Committee to Oversee the General Education Program

1996-2001 Chairperson, Ithaca College Premedical Sciences Advisory Committee, member from 1993-2001:

1985 -2008 Member of the Radiation Safety Committee, Radiation Safety Officer 1990-92, 2006-2008

1993-2008 Member of the Institutional Biosafety Committee, Chair 2000-2008

1992-1993 Facilities Committee for design of the Ithaca College New Science Building

1987-1989 Member of the C.P. Snow Committee

1985-2008 Participant in numerous recruiting activities

1985-2008 Biology Department Major Committee Service

Budget Committee	5 years
Personnel Committee	9 years
Curriculum Committee	3 years
Library Committee	3 years
Search Committee	10 searches for tenure eligible positions

CURRICULUM VITAE

Rebecca J. Sommer

July 1, 2009

Present Work Address

Bates College
Department of Biology
44 Campus Avenue
Lewiston, Maine 04240

phone: (207) 786-8202
fax: (207) 786-8334
email: rsommer@bates.edu

Home Address

319 Pine Tree Rd
Litchfield, Maine 04350

phone: (207) 268-3229

Education

1998 Ph.D. in Pharmacology
University of Wisconsin-Madison

1992 B.S. in Pharmacology and Toxicology
University of Wisconsin-Madison

Teaching and Research Experience

2006-present, Associate Professor, 1998-2006, Assistant Professor, Department of Biology, Bates College, Lewiston, Maine. Instruct undergraduate students in toxicological risk assessment, environmental toxicology, pharmacology and introductory biology courses at a selective undergraduate institution where members of the faculty teach five courses per year (9-12 contact hours per week). Research interests focus on studying the mechanisms by which environmental contaminants disrupt normal development, including investigations to determine the mechanisms by which developmental exposure to low levels of arsenic causes symptoms of obesity, diabetes and cardiovascular disease in male mice.

2003-present, Adjunct Faculty, Maine Center for Toxicology and Environmental Health, Bioscience Research Institute, University of Southern Maine, Portland, Maine. Collaborate in Center-wide research project that investigates the developmental effects of arsenic exposure in a mouse model system. Responsibilities include incorporating general aspects of developmental toxicology into experimental designs and investigating the impact of arsenic on the developing cardiovascular system. Also guest lecturer on cardiovascular toxicology in the Center's graduate-level *Introduction to Toxicology* course.

January – May, 2003, Visiting Scientist, School of Pharmacy, University of New Mexico, Albuquerque, New Mexico. Investigated the role of beta-adrenergic receptor signaling in the formation of dilated cardiomyopathy induced by developmental exposure to dioxin in a chick embryo model system.

Sommer-2

1993-1998, Graduate Research Assistant, laboratory of Dr. Richard Peterson, University of Wisconsin, Madison, Wisconsin. Doctoral research involved investigation of the mechanism by which *in utero* and lactational dioxin exposure impairs the rodent reproductive system, with an emphasis on determining how developmental exposure to dioxin decreases epididymal and ejaculated sperm numbers in the male rat and induces malformations of the external genitalia in the female rat.

1994-1997, Pharmacology Lecturer, Natural Sciences Department, Edgewood College, Madison, Wisconsin. Instructed nursing undergraduate students in pharmacology during a two credit, single semester course. Completely responsible for all aspects of the course including lecturing, discussion groups, office hours, exam writing, and grading.

1992-1993, Graduate Teaching Assistant, School of Pharmacy, University of Wisconsin, Madison, Wisconsin. Instructed pharmacy undergraduate students in pharmacology during weekly discussion groups and office hours. Shared exam writing, correcting and grading responsibilities with the professors that lectured in the course.

Honors and Distinctions

- 2006 Research Advisor and Mentor to Kay M. Gonsalves awarded a Pfizer Undergraduate Student Travel Award to attend the National Meeting of the Society of Toxicology, Charlotte, NC, March 25-29, 2007.
- 1996-1998 Samuel C. Johnson Distinguished Fellowship for Graduate Research
- 1995 Society of Toxicology Annual Meeting Graduate Student Travel Award
- 1993 Oscar Rennebohm Award for Outstanding Teaching as a Graduate Assistant School of Pharmacy, University of Wisconsin

External Funding (direct cost awards)

- 2005-2008 NIH/NIEHS AREA Grant Renewal, “Ah Receptor and Cardiac Adrenergic Signaling”, PI, \$100,000.
- 2004-2009 NIH/NCRR IDeA Networks of Biomedical Research Excellence (INBRE) Center Grant, “Center of Functional and Comparative Genomics in Maine”, My project within the Center is “Dioxin Exposure Impairs Embryonic Heart Development: Comparative Expression and Promoter Analysis of the β_1 -Adrenergic Receptor”, Junior Investigator, \$491,138.
- 2003-2006 NSF/DBI Major Research Instrumentation Grant, “Acquisition of a Multi-functional Imaging System for Research and Teaching in an Undergraduate Environment”, Co-PI, \$76,100.
- 2002-2004 NIH/NIEHS AREA Grant, “Effects of Dioxin on Cardiac Adrenergic Signaling”, PI, \$100,000.

- 2001-2004 NSF/CHE Major Research Instrumentation Grant, “Acquisition of a GC-MS and GC-FID for Research in Environmental Sciences at Bates College”, Co-PI, \$114,000.
- 2000 State of Maine Center for Innovation in Biotechnology Research and Development Grant, “Fish Vitellogenin Bioassay”, PI, \$11,425.

Internal Funding

- 2009 Mellon Innovation Grant, Bates College, *Research Mentor Trial and Pilot Study on Maternal and Developmental Effects of Arsenic Exposure in Mice*, PI, \$19,250.
- 2009 Mellon Innovation Grant, Bates College, *Curriculum Innovations in the Natural Sciences and Mathematics*, Co-PI, \$30,071.
- 2002 Hughes Student-Faculty Research Grant, Bates College, *Effects of Dioxin on Cardiac Adrenergic Signaling*, PI, \$10,300.
- 2000 Ladd Annual Collection Development Grant, Bates College, Co-PI, \$5,000.
- 2000 Hoffman-Mellon Grant for Student Research, Bates College, PI, \$1,000.
- 1999 Hughes Student-Faculty Research Grant, Bates College, *Zebrafish Vitellogenin Bioassay*, PI, \$13,500.

Publications (* denotes a Bates College undergraduate student)

1. Sommer, R.J. Cardiac Physiology and Pharmacology. In: Cardiovascular Toxicology, Vol. 7 of Comprehensive Toxicology Series, Eds. M.K. Walker and M.J. Campen, Elsevier, Amsterdam, The Netherlands. In press, with an estimated publication date of Sept. 2010.
2. Sommer, R.J., Hume, A.J.*, Ciak, J.M.*, VanNostrand, J.J.*, Friggens, M. and Walker, M.K. (2005). Early developmental 2,3,7,8-tetrachlorodibenzo-*p*-dioxin exposure decreases chick embryo heart chronotropic response to isoproterenol but not to agents affecting signals downstream of the beta-adrenergic receptor. *Toxicol. Sci.* **83**, 363-371.
3. Sommer, R.J. (2004). A Successful AREA Grant Proposal in the Biological Sciences. *Council on Undergraduate Research Quarterly*, **24(3)**, 125-128.
4. Lewis, B.C., Hudgins, S., Lewis, A., Schorr, K., Sommer, R.J., Peterson, R.E., Flaws, J.A., and Furth, P.A. (2001). In utero and lactational treatment with 2,3,7,8-tetrachlorodibenzo-*p*-dioxin impairs mammary gland differentiation but does not block the response to exogenous estrogen in the post pubertal female rat. *Toxicol. Sci.* **62**, 46-53.

5. Dienhart, M.K., Sommer, R.J., Silbergeld, E., Peterson, R.E., and Hirshfield, A.N. (2000). Gestational exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin induces developmental defects in the rat vagina. *Toxicol. Sci.* **56**(1), 141-149.
6. Sommer, R.J., Sojka, K.M., Pollenz, R.S., Cooke, P.S., and Peterson, R.E. (1999). Ah receptor and ARNT protein and mRNA concentrations in rat prostate: Effects of age and 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. *Toxicol. Appl. Pharmacol.* **155**, 177-189.
7. Flaws, J.A., Sommer, R.J., Silbergeld, E., Peterson, R.E., and Hirshfield, A.N. (1997). *In utero* and lactational exposure to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD) induces genital dysmorphogenesis in the female rat. *Toxicol. Appl. Pharmacol.* **147**, 351-362.
8. Sommer, R.J., and Peterson, R.E. (1997). *In utero* and lactational exposure of the mouse to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin (TCDD): Effects on male reproductive tract development. *Dioxin '97, Organohalogen Compounds* **34**, 360-363.
9. Sommer, R.J., Ippolito, D.L., and Peterson, R.E. (1996). *In utero* and lactational exposure of the male Holtzman rat to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin: Decreased epididymal and ejaculated sperm numbers without alterations in sperm transit rate. *Toxicol. Appl. Pharmacol.* **140**, 146-153.
10. Roman, B.L., Sommer, R.J., Shinomiya, K., and Peterson, R.E. (1995). *In utero* and lactational exposure of the male rat to 2,3,7,8-tetrachlorodibenzo-*p*-dioxin: Impaired prostate growth and development without inhibited testicular androgen production. *Toxicol. Appl. Pharmacol.* **134**, 241-250.
11. Bjerke, D.L., Sommer, R.J., Moore, R.W., and Peterson, R.E. (1994). Effects of *in utero* and lactational 2,3,7,8-tetrachlorodibenzo-*p*-dioxin exposure on responsiveness of the male rat reproductive system to testosterone stimulation in adulthood. *Toxicol. Appl. Pharmacol.* **127**, 250-257.
12. Vanden Heuvel, J.P., Davis, J.W., Sommer, R., and Peterson, R.E. (1992). Renal excretion of perfluorooctanoic acid in male rats: Inhibitory effect of testosterone. *J. Biochem. Toxicol.* **7**, 31-36.

In Preparation Manuscripts (* denotes a Bates College undergraduate student)

1. Carmody, M., Ciak, J.M.*, Davie, E.*, Gonsalves, K.M.*, and Sommer, R.J. Aryl hydrocarbon receptor (AhR) mediates β_2 -adrenergic receptor gene transcription. In preparation.
2. Austin, R., Allard, J.*, DiGiando D.*, Edgerly, J.*, Fink, K.*, Solomon, L.*, Quinn, R.L.* and Sommer, R.J. Imposex frequencies and a possible TBT-resistant population of dogwhelks (*Nucella lapillus*) in Maine. In preparation.

SUGGESTED WEBSITES FROM OUR WORKSHOP PANELISTS

National Institutes of Health, Homepage – <http://www.nih.gov/>

National Institutes of Health, NIH Academic Research Enhancement Award (AREA) Grants – <http://grants.nih.gov/grants/funding/area.htm>

National Institutes of Health, Frequently Asked Questions – Academic Research Enhancement Award (AREA) – http://grants.nih.gov/grants/funding/area_faq.htm

National Institutes of Health, Peer Review Process – http://grants.nih.gov/grants/peer_review_process.htm

National Institutes of Health, Center for Scientific Review, Descriptions of the Integrated Review Groups, Study Sections, and Small Business Activities of the Center for Scientific Review – <http://cms.csr.nih.gov/PeerReviewMeetings/CSRIRGDescriptionNew/>

National Institutes of Health, NIH Extramural Nexus – <http://grants.nih.gov/grants/nexus.htm>

National Cancer Institute, Quick Guide for Grant Applications - <http://deainfo.nci.nih.gov/extra/extdocs/gntapp.htm>

National Institute of Allergy and Infectious Diseases, All About Grants Tutorial - <http://www.niaid.nih.gov/ncn/grants/default.htm>

National Institute of Neurological Disorders and Stroke, Writing a Grant Application: A “Technical” Checklist - http://www.ninds.nih.gov/funding/grantsmanship_checklist.htm

National Institute of Allergy and Infectious Diseases, Sample R01 Applications and Summary Statements - <http://www.niaid.nih.gov/ncn/grants/app/default.htm>

National Science Foundation, Homepage – <http://www.nsf.gov/>

National Science Foundation, Guide to Programs/Browse Funding Opportunities – http://www.nsf.gov/funding/browse_all_funding.jsp

National Science Foundation, Grant Proposal Guide (GPG) – http://www.nsf.gov/pubs/gpg/nsf04_23

National Science Foundation, FastLane Homepage – <https://www.fastlane.nsf.gov/fastlane.jsp>

National Science Foundation, Search NSF Awards – <http://www.nsf.gov/awardsearch/>

National Science Foundation, NSF Custom News Service – <http://www.nsf.gov/mynsf/>

Successful AREA Grant Proposals in the Biological Sciences

Rebecca Sommer

Bates College, Lewiston ME

Title: Effects of Dioxin on Cardiac Adrenergic Signaling NIH AREA Awards in 2002 and 2005

Academic Research Enhancement Award (AREA) grants fund small-scale health-related research projects at institutions that are not major recipients of National Institutes of Health (NIH) funding. A major goal of the program is to expose undergraduate students to meritorious biomedical and behavioral research to encourage students to pursue graduate studies in the health sciences. Special considerations are given during the funding decision process to proposals from investigators at predominately undergraduate schools and the percentage of funded AREA proposals has averaged a healthy 25 - 31% from 2004 to 2007.

Recently, NIH announced that funds from the American Recovery and Reinvestment Act of 2009 will be used to support a single extra round of AREA grant applications. The Recovery Act-funded AREA Request for Applications (RFA-OD-09-007) has the same objectives as the original AREA Program Announcement (PA-06-042), but it increases the total funding limit from the current \$150,000 to \$300,000 in direct costs, and it extends eligibility from institutions receiving less than 3 million dollars annually in funding from the NIH to those receiving less than 6 million dollars. The due date for the Recovery Act-funded AREA applications is September 24, 2009. NIH plans to extend the increased direct cost and institution eligibility limits to the standard AREA Program beginning with the October 25, 2009 receipt date. However, to date, the new Parent AREA R15 Funding Opportunity Announcement has not been released.

Key factors to a successful AREA grant proposal include:

- an important research question;
- a focused and organized proposal;
- demonstration of expertise; and
- a positive impact on the research activity of undergraduate students and the principle investigator.

Important Research Question

Absolutely essential to the success of an AREA proposal is that it must investigate an important research question that advances knowledge in the proposed field of science. AREA grants are evaluated at the same time as other types of NIH grant proposals from research-intensive institutions. AREA projects designed primarily as teaching exercises for undergraduate students run the risk of seeming trivial in comparison. Only after your research has been deemed worthy and relevant to the objectives of the Institute or Center will it go on for further consideration.

Establishing an important research question is the first, and perhaps hardest, step on the road to getting an AREA proposal funded. Your research question might be an extension of your past work, a completely new area of research, or a project that falls somewhere in between these two possibilities. In my case, I stayed within my field of developmental toxicology of dioxin but switched to a new organ system and animal model. My previous work investigated the developmental toxicity of dioxin on the reproductive system of rats whereas my AREA proposals investigate the developmental toxicity of dioxin on the cardiovascular system of chick embryos.

The process that led to my first AREA proposal began with a conversation during a poster session at a national meeting of the Society of Toxicology. A colleague, and expert in the field of developmental dioxin cardiovascular toxicology, was presenting results that seemed to me to be consistent with alterations in cardiac β -adrenergic receptor (β -AR) signaling. The colleague and her laboratory were focused on other potential mechanisms; however, they were enthusiastic about starting a collaboration that would allow me to investigate the role of β -AR signaling in dioxin-induced cardiovascular toxicity. The collaboration presented a perfect opportunity for me to work on an important research question that was different enough from the “hot” hypotheses of several research-intensive programs so as not to be in direct competition with them.

Encouragement and advice from personnel at the National Institute of Environmental Health Sciences (NIEHS), the NIH institute with research objectives most relevant to my work, and from my collaborator further supported my pursuing an AREA grant. NIEHS had issued program announcements identifying research similar to mine (“Environmentally Induced Cardiovascular Malformations” and “Fetal Basis of Adult Disease: Role of the Environment”) as having high priority. In addition, an email to the NIEHS AREA Program Contact Person briefly describing my research ideas was answered with strong encouragement to submit an AREA grant application. I also discussed initial research ideas with my collaborator who has a successful record of getting NIH funding and has served on several NIH Study Sections. Her experience and advice allowed me to prepare a first-time submission that was closer in quality to a revised proposal submitted for a second round of evaluation.

Focused and Organized Proposal

Also important for the success of an AREA grant application is having a focused and organized research proposal. This “focus and organization” is both at the level of the writing style of the proposal and at the level of the research approach. No matter how great your research if you cannot effectively and efficiently communicate your hypothesis, rationale, and methods your proposal will not be funded. Likewise, a superbly written proposal about mediocre research will also go unfunded.

When writing your proposal, develop a focused hypothesis and structure all other parts of the research grant around it. The “Specific Aims” and “Research Design and Methods” sections should propose experiments that will directly test your hypothesis

while the “Background and Significance” and “Preliminary Data” sections should present the essential information to build a strong argument for your hypothesis.

Never assume that your hypothesis is obvious. It must be explicitly stated prior to the “Specific Aims” section, either by giving a simple hypothesis statement or by incorporating the hypothesis statement into your abstract and placing the abstract directly before the “Specific Aims” section. To make your hypothesis statement as obvious as possible for the reviewers, I recommend putting it in bold type and actually using the phrase “we will test the hypothesis that....”

The combination of abstract plus “Specific Aims” section at the beginning of your proposal can be used as a preview for your entire proposal, alerting the reviewers to key information when they first read your proposal. If needed, it can also act as an excellent summary, reminding the reviewers of your most important points during their deliberations. This can be accomplished by incorporating brief methods phrases and summary sentences into your “Specific Aims” section and might be illustrated best by examining an excerpt from my AREA proposal.

Abstract

...In this proposal we will investigate whether the cardiomyopathy and subsequent heart failure observed in embryonic chicks exposed to TCDD is associated with a direct increase in β_1 -AR gene expression followed by a maladaptive decrease in β_1 -AR signaling. In support of this hypothesis, we have detected a 30% increase in cardiac β_1 -AR mRNA in embryonic day 10 chicks exposed to TCDD on day 0 and have observed a reduction in the ability of TCDD-exposed embryonic chicks and weanling mice to increase heart rate in response to isoproterenol, a β -AR agonist (see Preliminary Studies). The existence of four putative dioxin response elements (DREs) in the 5' enhancer region of the human β_1 -AR gene raises the possibility that transcription of the gene may be directly regulated by the AhR. To date, most of our experiments have utilized a chick embryo model system, however, avian species may regulate the β_1 -AR gene differently than mammals by expressing a β_1 -AR splice variant. **Experiments contained within this proposal will (1) determine whether the mouse also expresses the β_1 -AR splice variant; (2) test the hypothesis that the β_1 -AR gene is directly regulated by AhR; and (3) determine whether the decreased cardiac β_1 -AR responsiveness observed in TCDD-exposed chick and mouse heart is a direct effect of TCDD on cardiac myocytes.** Completion of these studies will provide important mechanistic data on the cardiovascular toxicology of TCDD and provide insight into the normal role of the AhR in the developing heart.

A. Specific Aims

1. **Clone the chick β_1 -AR promoter region and full length cDNAs of the β_1 -AR and β_1 -AR splice variant and determine whether the β_1 -AR splice variant exists in the mouse.** Our laboratory has successfully used reverse transcriptase-polymerase chain reaction (RT-PCR) to amplify cDNA fragments of the chick β_1 -AR and β_1 -AR splice variant (see Preliminary Studies). We will continue to use RT-PCR and rapid amplification of cDNA ends (RACE) to obtain full length cDNAs of the β_1 -AR and β_1 -AR splice variant and use genome walking techniques to clone the β_1 -AR promoter region to determine whether the chick β_1 -AR gene contains DRE sequences similar to mammals. A combination of RT-PCR and

Northern analyses will be used to determine whether the avian β_1 -AR splice variant exists in the mouse heart.

2. **Determine whether the chick and mouse β_1 -AR genes are directly regulated by AhR.** Electrophoretic mobility shift assays will determine whether the liganded AhR directly binds the chick and mouse β_1 -AR promoters. If specific binding is detected, transient transfection experiments using a luciferase reporter gene under the control of the chick or mouse β_1 -AR promoter will determine whether the binding is sufficient to transactivate expression.
3. **Determine whether the TCDD-induced reduction in β -AR responsiveness is due to direct effects on cardiac myocytes.** On going research in our laboratory has observed a reduction in the ability of TCDD-exposed embryonic chicks and weanling mice to increase heart rate in response to a β -AR agonist (see Preliminary Studies). TCDD exposure of chick primary myocyte or murine atrial myocyte (HL-1) cells in culture, followed by exposure to pharmacological agents that stimulate β -AR signaling will determine whether reduced β -AR responsiveness observed *in vivo* is a direct effect of dioxin on cardiac myocytes or secondary to other factors such as increased circulating catecholamines or hypoxia, conditions that have been associated with heart failure and known to secondarily alter β_1 -AR signaling in mammalian systems.

A focused research approach is always important but it is especially so with an AREA grant proposal. Many reviewers are skeptical of the amount of research that can be accomplished with an AREA grant at a predominately undergraduate institution. Compared to many other types of NIH grants, AREA grants provide a small amount of money over a short amount of time (currently a maximum of \$150,000 in direct costs over a 1-3 year time period). Reviewers may also find it difficult to believe that you will complete the proposed research without graduate students, post-docs or senior scientists, while carrying a heavy teaching load. Keeping the number of specific aims of your proposal to the minimum needed to address your research question assures the reviewers that your proposal is “doable” and that you have a good sense of “what it takes” to bring a research project to completion. I limited my second AREA proposal to three closely related specific aims (see above) to be completed in the three-year time frame in which I planned to spend the maximum allowable amount of AREA grant funding. Reviewers commented positively that my proposed specific aims were “focused and on-target” for the 3-year timeframe of the project.

Demonstration of Expertise

A goal of the AREA program is to promote research at institutions that have received little NIH funding and thus there is more flexibility than with most types of NIH grants to demonstrate your ability to conduct the proposed research. A strong publication record and convincing preliminary data are the first means by which reviewers gauge potential for success, however, you should not be deterred from submitting an AREA proposal if you are lacking in these criteria.

Including a collaborator with a proven track record is an excellent way to convince reviewers that, if funded, you will accomplish your research objectives. Any collaborators must supply a letter of support stating both their enthusiasm for the

project and exactly how they will be involved with the proposal. The collaborators' roles in the project should also be given in the "Key Personnel" section and possibly in the "Modular Budget" narrative if the collaborators are to receive any funds from the AREA proposal. Collaborators must also supply "Biographical Sketches", "Support" and "Resource" pages but the extra effort will strengthen the proposal.

Providing detailed methods in the "Experimental Design and Methods" section can also reassure the referees that you know how to complete the proposed research. It is important to include "Alternative Approaches" to demonstrate that you understand possible limitations in your methods and that you have the means to overcome them. It is also possible to include statements about your experience with particular techniques in the "Experimental Design and Methods" section. For example, after describing the methods to isolate β -AR receptor and determine receptor affinity and density in my first AREA proposal, I included the following sentence:

We have successfully prepared microsomal preparations from chick heart for Na^+/K^+ ATPase enzyme activity assays [53] and have considerable experience conducting radioimmunoassays [54; 55; 56], a technique that has similar principals and methodologies as the proposed receptor binding assays.

Reviewers of AREA grants will consider the combined strengths and weaknesses of your publication record, preliminary data, rationale and hypothesis, inclusion of collaborators, and experimental methods when assessing your proposal. Strengths in one or more of the categories can often offset weaknesses in other categories.

Positive Impact

Finally, reviewers of AREA grant applications will also consider the environment of the institution and the impact on its members. Specifically, they are instructed to consider (1) the principal investigator's experience in supervising undergraduate students in research; (2) the suitability of the applicant school for an award in terms of strengthening the research environment and exposing students to research; (3) the availability of well-qualified students that are likely to pursue careers in biomedical and behavioral sciences; and (4) evidence of institutional support. The above points must be addressed in an "AREA Grant Statement" located following the principal investigator's usual information on the "Resources" page. Point one can be addressed by giving the number of student research projects that you have supervised and by listing any of your publications, abstracts, and regional or national meetings with which undergraduate students have participated. Depending on your institution, data needed for points two through four may be available from Development, Alumni and/or Admissions Offices. These data should include information on the quality of your institution's student body, the number of students majoring in the sciences, the number of students going on to professional and graduate programs in the health sciences, and give statistics on the quality of the institution's research facilities (overall laboratory space, equipment, and external and internal support for instrumentation and research).

Discussion of the involvement of specific undergraduate students in the proposed research also needs to be given within the “AREA Grant Statement” and briefly in the “Key Personnel” and “Experimental Design and Methods” sections.

Many principal investigators at undergraduate institutions successfully combine research and their normal teaching and service responsibilities. If however the principal investigator plans a pre-tenure leave, sabbatical or any other type of release time during an AREA grant, monetary support for the leave may be incorporated into the budget. Administrative approval for the release time must be given prior to the grant submission and documented in the grant proposal by including a letter from the Office of the Dean of Faculty. AREA grant funding can also be used to cover costs associated with travel and other arrangements needed to work at a collaborator’s laboratory if those expenses are relevant to your proposed work.

If you are considering an AREA grant application, there are three submission dates per year (in February, June and October). You can familiarize yourself with the AREA program at the NIH AREA website, <http://grants.nih.gov/grants/funding/area.htm>. It has a FAQ section, lists eligible institutions, provides email addresses for AREA Program Contact Persons, gives descriptions of Institution and Center objectives, and lists Program Announcements for each Institute and Center.

Happy writing and good luck!

Ancillary Materials

Contact Information

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Biographical Sketch

Dr. Rebecca Sommer is an associate professor in the Biology Department and Program in Environmental Studies at Bates College, Lewiston, Maine, where she teaches introductory biology, environmental toxicology, pharmacology, understanding cancer and risk assessment courses. She has a Ph.D. in pharmacology from the School of Pharmacy at the University of Wisconsin. Her research interests include the mechanisms by which environmental pollutants disrupt normal development and she is currently working on two developmental toxicology research projects her laboratory. The first project investigates the mechanism by which developmental dioxin exposure induces dilated cardiomyopathy in a chick embryo model system and the second project investigates the mechanisms by which developmental exposure to low levels of

arsenic causes symptoms of obesity, diabetes and cardiovascular disease in male mice.

Photo Captions

sommer1.



January 2009

EYE on PI

Tips for Great Grant Writing, Part 1: What is NIH Looking For?

I What Does NIH Look For in a Grant Application?

Because NIH is comprised of 24 different grant-awarding Institutes and Centers (ICs) which provide funding, there is no simple answer to this question. However, if you are talking to an NIH Program Official about your idea or potential research project, you are already on the right track to receiving NIH funding.

While NIH awards many grants specifically for research, we also provide grant opportunities that support research-related activities, including: construction, training, career development, conferences, resource grants and [more](#). Specifically, we encourage projects that have the three following qualities:

- **NIH looks for grant proposals of high scientific caliber** that are relevant to public health needs and are within [NIH Institute and Center](#) (IC) priorities. ICs highlight their specific research priorities on their Web sites. Applicants are encouraged to contact the appropriate IC to discuss the relevancy and/or focus of the proposed research before submitting an application. NIH also has a number of broad [NIH-wide initiatives](#) that may be of interest.
- **NIH strongly encourages investigator-initiated research** across the spectrum of our mission. We issue hundreds of [funding opportunity announcements \(FOAs\)](#) in the form of [Program Announcements \(PAs\)](#) and [requests for applications \(RFAs\)](#) to stimulate research in particular areas of science. Some PAs, called "[Parent Announcements](#)," span the breadth of the NIH mission in order to ensure we have a way to capture "unsolicited" applications that do not fall within the scope of targeted announcements. The majority of NIH applications are submitted in response to parent announcements.
- By law, NIH cannot support a project already funded or pay for research that has already been done. **Projects must be unique.** Although you may not send the same application to more than one [Public Health Service \(PHS\)](#) agency at the same time, you can apply to an organization outside the PHS with the same application. If the project gets funded by another organization, however, it cannot also be funded by NIH.

Parts of this column have been extracted from the "About Grants" section of the [Office of Extramural Research's Home Page](#).

Be sure to watch this space next month for new tips on great grant writing!

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March 2009

EYE on PI

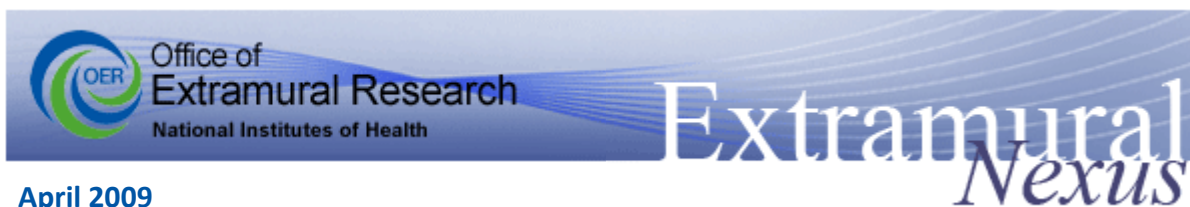
Tips for Great Grant Writing, Part 2: Get to Know the Projects and Activities of NIH-funded PIs

Learning more about projects already funded by NIH can be a great help when you are preparing your grant proposal. Using the Research Portfolio Online Reporting Tool ([RePORT](#)), you can craft a comprehensive search of all NIH funding activities according to your specific interests. This search will result in a list of funded projects, for each of which you will be able to view an abstract and statement of public health relevance, as well as contact information for the project's PI.

Connection to NIH funding activities is just a few clicks away. Head to the [RePORT](#) homepage and click on NIH CRISP. Here you can filter your search according to key words, general topics, sponsoring Institutes or Centers, geographical locations, and fiscal years. As you read through project descriptions, keep in mind that one of NIH's primary goals is to develop, maintain, and renew biomedical resources that will improve our nation's health. Think about how your work might build upon projects that NIH has already funded, and highlight in your proposal how your scientific work will be relevant to public health. You might also consider using CRISP to locate potential collaborators or mentors.

For more tips on effective grant writing, visit the [About Grants section of the OER homepage](#), and keep an eye out for this column in next month's Nexus.

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April 2009

EYE on PI

Tips for Great Grant Writing (Part 3): Organize Your Research Plan



Help reviewers find exactly what they are looking for in your research plan by breaking your proposal down according to the primary review criteria: significance, investigator (s), innovation, approach, and environment. Begin each section with clear, descriptive headers that effectively frame your research plan.

A succinct introduction should address the significance of your project, weighing its impact on your field and related fields, as well its impact in the greater context of public health. Consider the following questions from the Enhanced Review Criteria chart:

- Does the project address an important problem or critical barrier to progress in the field?
- If the aims of the project are achieved, how will scientific knowledge, technical capability, and/or clinical practice be improved?
- How will successful completion of the aims change the concepts, methods, technologies, treatments, services, or preventative interventions that drive this field?

Next, address how PD/PIs, collaborators, and other researchers are suited to the project. Outline appropriate experience and training, and highlight any accomplishments that have encouraged advancements in the field(s). If the project is collaborative or multi-PD/PI, show that investigators have complementary and integrated experience.

Now reflect on the innovation that project offers. Keep in mind that even if a project not, by nature, innovative, it may nonetheless be essential to advancing a field. Discuss how your work will challenge or improve current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches, or methodologies, instrumentation, or interventions or by refining the use of these concepts, approaches, methodologies, or instrumentation.

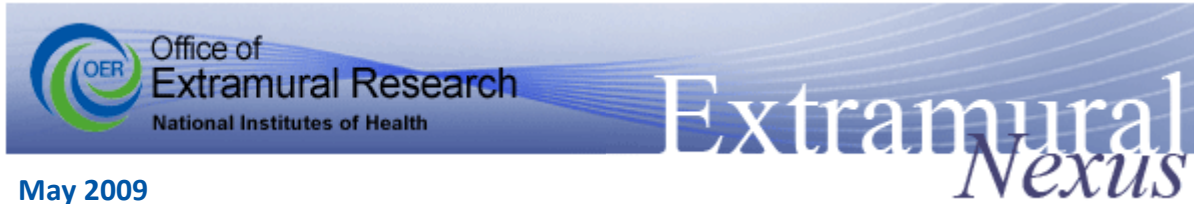
A thorough description of the approach you will take is critical. Show how well-reasoned and appropriate your overall strategy, methodology, and analyses are to accomplishing the specific aims of your project.

Following the details of your approach, include a profile of the environment in which the work will be done. Consider the adequacy of resources such as institutional support and equipment. Also take into account how the project will benefit from any unique features of the scientific environment, subject populations, or collaborative arrangements.

Finally, add a section that addresses items of ethical concern applicable to your project—for example the use of vertebrate animals or human subjects (including gender and minority representation or the inclusion of children).

For more resources you can use as you prepare your application, please visit <http://era.nih.gov/ElectronicReceipt/>.

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May 2009

EYE on PI

Tips for Great Grant Writing (Part 4): New Investigator? Why and How to Go for an R01!

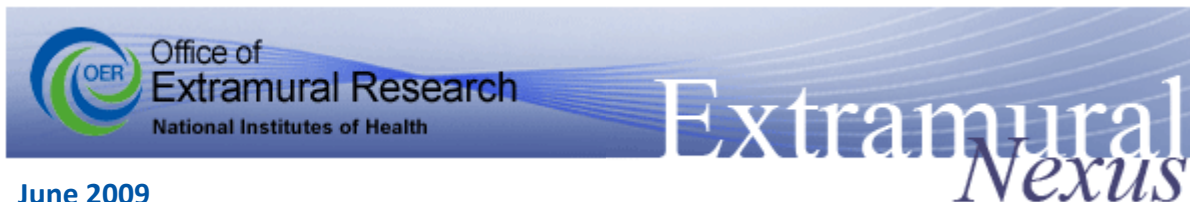
Over the years, there has been varying advice about the best type of grant with which to launch your career--R21, R03, R01? NIH recently issued a guide notice suggesting that you consider an R01 for a number of reasons. As you may know, New or Early Stage Investigator Status affords you [special consideration](#) during the peer review process for R01 grants.

Special consideration for Early Stage Investigators (ESIs) during the Peer Review process means that peer reviewers will focus more on the investigator's experience and training rather than the record of accomplishments that have advanced the investigator's chosen field. Furthermore, ESIs are not expected to provide the same depth of preliminary data as one would expect from an established investigator.

Additionally, the three to five year award period for an R01 provides more time for new investigators to establish themselves than does the two-year funding limit of R03s and R21s.

To help new investigators prepare successful R01 applications, the National Institute of Allergies and Infectious Diseases has published a [set of outstanding R01 applications and summary statements](#). Here you may read two complete R01 application packages along with the summaries and recommendations of the committees that reviewed them. Remember that the structure and presentation of an application may vary depending on the type of scientific project proposed. You might also consider seeking out an NIH-funded investigator in your field and asking to read his or her application. Please note that the percentiles and priority scores assigned do not reflect the new, [enhanced peer review criteria](#).

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June 2009

EYE on PI

Tips for Great Grant Writing (Part 5): Developing Your Budget

There's a lot to consider when you are developing a budget for your research grant application. While the best resources at your disposal are the sponsored research programs office at your institution, your departmental administrative officials, your mentors and your peers, we have compiled some tips and reminders that may be helpful for preparing your budget. For more detailed information, visit our [Developing Your Budget webpage](#). We offer a brief overview below.

Consider the Costs

The cost principles address four tests that NIH follows in determining the allowability of costs. Costs charged to awards must be allowable, allocable, reasonable, necessary, and consistently applied regardless of the source of funds. Information on the applicable cost principles and on allowable and unallowable costs under NIH grants is provided in the [NIH Grants Policy Statement](#) under Cost Considerations.

Know Your Limits!

Read the Funding Opportunity Announcement (FOA) carefully for budget criteria. Relevant FOA sections include: II.1 Mechanism of Support, II.2 Funds Available, III.2 Cost Sharing or Matching, and IV.5 Funding Restrictions. Identify all the costs that are necessary and reasonable to complete the work described in your proposal. Request no more and no less!

Distinguish between allowable Direct Costs and allowable Facilities and Administrative Costs

Direct costs are costs that can be identified specifically with an institutional project or research activity.

F&A costs are those that a grant incurs for administrative overhead that are not directly associated with your project. These costs are also known as "indirect costs."

Total costs include both allowable direct costs and allowable F&A costs. See our [budget webpage](#) for more detailed information.

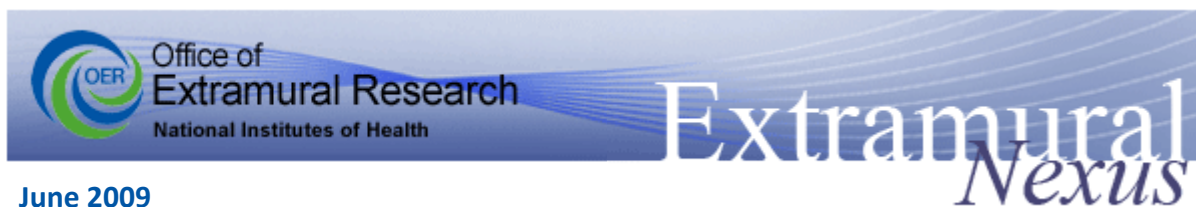
Modular versus Detailed Budgets

The NIH uses two different formats for budget submission depending on the total direct costs requested and the activity code used. To determine which format you should use, see the flowchart and descriptions on our [budget webpage](#).

We do not expect your budget to predict perfectly how you will spend your money five years down the road. However, we do expect a reasonable approximation of what you intend to spend. Reviewers want to see that you understand the scope and breadth of your project.

Links to more resources that will help you formulate your budget are at the bottom of the [Developing Your Budget webpage](#).

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June 2009

EYE on PI

Need Help Interpreting the New Review Scores?

Implementation of many of the Enhancements to Peer Review began with the May 2009 review meetings, and some applicants are already receiving summary statements with scores determined under the new system. If you need help understanding your grant application's review scores, read on...

Reviewers have been instructed to provide scores for each individual review criterion, and an overall impact/ priority score for each application. These scores are given in whole numbers on a 9-point rating scale according to the following descriptions and additional guidance:

Impact	Score	Descriptor	Strengths/Weaknesses
High Impact	1	Exceptional	
	2	Outstanding	
	3	Excellent	
Moderate Impact	4	Very Good	
	5	Good	
	6	Satisfactory	
Low Impact	7	Fair	
	8	Marginal	
	9	Poor	
Non-numeric score options: NR = Not Recommended for Further Consideration, DF = Deferred, AB = Abstention, CF = Conflict, NP = Not Present, ND=Not Discussed			

Score	Descriptor	Additional Guidance on Strengths/Weaknesses
1	Exceptional	Exceptionally strong with essentially no weaknesses
2	Outstanding	Extremely strong with negligible weaknesses
3	Excellent	Very strong with only some minor weaknesses
4	Very Good	Strong but with numerous minor weaknesses
5	Good	Strong but with at least one moderate weakness
6	Satisfactory	Some strengths but also some moderate weaknesses

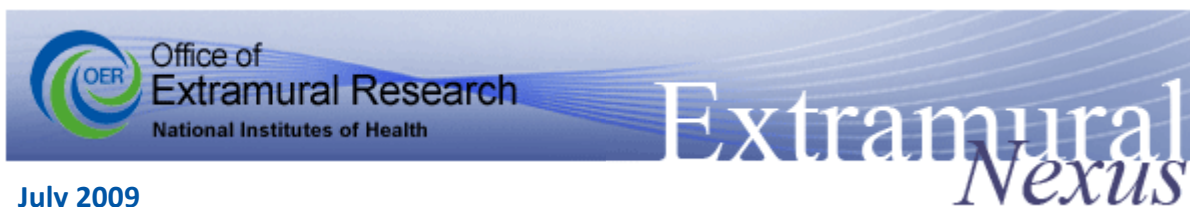
7	Fair	Some strengths but with at least one major weakness
8	Marginal	A few strengths and a few major weaknesses
9	Poor	Very few strengths and numerous major weaknesses
<p>Minor Weakness: An easily addressable weakness that does not substantially lessen impact</p> <p>Moderate Weakness: A weakness that lessens impact</p> <p>Major Weakness: A weakness that severely limits impact</p>		

The final overall impact/priority score for each application is calculated by determining the average of the overall impact/priority scores given by all eligible review panel members to one decimal point and multiplying by ten. Thus, the new scores range from 10-90 in whole numbers.

For example, if we consider a final overall impact/priority score of 55, we can see that the score should reflect a "good" to "satisfactory" application that the reviewers judged to be of moderate impact, and that it has some strengths, but also one or more moderate weaknesses.

For more information about the guidance given to reviewers, download the Reviewer Orientation at http://enhancing-peer-review.nih.gov/reviewer_orientation.ppt or visit the Enhancing Peer Review Web site at <http://enhancing-peer-review.nih.gov/index.html>.

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July 2009

Top Stories

Understanding Your Peer Review Summary Statement

Implementation of many of the Enhancements to Peer Review began with the May 2009 review meetings, and applicants are receiving summary statements with new features, such as scores determined under the new system. To understand your summary statement, read on...

Scores

The final overall impact/priority score appears on the first page of the summary statement, and is in a new 2-digit format. (See our June issue for tips on [interpreting your score](#).) The final score for each application represents the overall impact of the application. It is calculated as the average (to one decimal point) of the overall impact/priority scores (1-9 in whole numbers only) given by all eligible review panel members, multiplied by ten (so the new scores range from 10-90 in whole numbers).

In addition, the scoring of individual criteria was instated to help improve the quality and transparency of review, as well as help identify strengths and weaknesses for individual components. The summary statement shows the criterion scores given by assigned reviewers, in the critique section. Please remember that no direct correlation exists between criterion score(s) and the overall impact/priority score from each reviewer. That is, no formula is used to derive the overall impact/priority score from the individual criterion scores, and reviewers are instructed to weigh the different criteria as they see fit in deriving their overall scores.

Résumé and Summary of Discussion

As in the past, the Résumé and Summary of Discussion section is prepared by the NIH Scientific Review Officer (SRO) and summarizes the discussion of the application during the review meeting. Applications do not receive a Résumé and Summary of Discussion if they were not discussed.

Critiques

The critique format is new with this review cycle. To help improve the quality and transparency of review, NIH has developed [formatted critique templates](#) for reviewers to use to record their comments in the form of bullets, making succinct, focused points. Reviewers have been asked to focus on major strengths and weaknesses, i.e., ones that contributed directly to the overall rating of the application. In the critique section of the summary statement, you will see the individual criterion scores and comments from each reviewer. Comments should help the applicant identify strengths and weaknesses of the overall application, as well as for each criterion.

Further Questions

For more information about the guidance given to reviewers, download the [Reviewer Orientation](#) or visit the Enhancing Peer Review [site](#).

If you have questions related to the review of your particular application, contact information for the SRO is provided at the end of your summary statement.

If you have questions related to your application and how it fits into the funding priorities of the Institute or Center, information for the Program Contact is provided at the top of the first page of the summary statement.

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