BME/BIOL 207

Biomolecular recognition

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Main topics

DNA-DNA
DNA-RNA
RNA-RNA
RNA-protein
DNA-protein
protein-protein

Specialized and complex examples:
• Recognition of light
• Antibody recognition, generation, use
• Cell-cell interactions - organ systems

Syllabus on web site
Course goals

“Biomolecular Recognition”

To understand:
Concepts      Problems      Solutions

• Appreciate the complexity of biological systems
• Understand the limitations of current approaches
  - technical, biological and intellectual
• Practice finding solutions

How:
Lectures      Primary literature      Grant writing

Transition from “reader” to “writer”
Typical class format

Read assigned materials before class

Lecture

Paper presentation and discussion
Web

Class web site:
http://courses.soe.ucsc.edu/courses/bme207/Fall11/01

From off-campus, you will have to log in with your SOE username/password to access

Lectures, papers, assignments updated throughout - check site weekly
Tests and assignments

Reading - every meeting

Research paper reports

Take-home problem sets

Grant proposal - NIH style

**Grading:** Grade or S/U
Office hours

PSB 310

Or by appointment

Email: cforsber@soe.ucsc.edu

“BME 207” in title
Cheating

Zero tolerance

Plagiarism

See statement on Academic Misconduct in syllabus

Library guide on Citing Sources and Plagiarism: http://library.ucsc.edu/science/instruction/Handouts/CitingSourcesBio80.pdf
NetTrail: http://nettrail.ucsc.edu/ (Section XI, Info Ethics)
The Center for Teaching Excellence Teaching Toolbox http://ic.ucsc.edu/CTE/teaching/difficult.html
Disability Resources

Contact the Disability Resource Center (DRC) to request an Accommodation Authorization

459-2089 (voice), 459-4806 (TTY)

If you qualify for classroom accommodations because of a disability, please get an Accommodation Authorization from the Disability Resource Center (DRC) and submit it to me in person outside of class (e.g., office hours) within the first two weeks of the quarter. Contact DRC at 459-2089 (voice), 459-4806 (TTY), or http://drc.ucsc.edu for more information on the requirements and/or process.
BME/BIOL 207
Biomolecular recognition
Grant writing
Why write a grant?

Money

Recognition

Clarify ideas

Get new ideas

Stay focused
Funding sources and mechanisms

Federal: NIH, NSF, DOD, DOE

State: CIRM, UC system

Non-profit organizations: ACS, Leukemia & Lymphoma Society

NIH: research grants, training grants, career awards, program awards, instrumentation grants
Funding sources and mechanisms

R01: “The Research Project (R01) grant is an award made to support a discrete, specified, circumscribed project to be performed by the named investigator(s) in an area representing the investigator's specific interest and competencies, based on the mission of the NIH.”

http://grants.nih.gov/grants/funding/r01.htm

Investigator-initiated vs RFA

Why do funding attempts fail?

- Idea not important
- Ideas not novel
- Scope too big, not achievable
- Goals unfocused
- Investigator not qualified, no track record in field
- Methods inadequate/outdated; technically or in the analytical phase
- Environment insufficient, infrastructure lacking
- Unclear what the goals and objectives are
- Logic lacking
- Poor writing
- Misinformation – don’t know the field

Other proposals were better
NIH-style grant format

Specific Aims – 1 page

Research Strategy – 12 pages max
  Significance
  Innovation
  Approach
    Background
    Preliminary data
    Experimental design, aim by aim

+++: 71 pages
The review process

Why is it important to understand the review process?

Know the criteria

Think like a reviewer

Number one objective: ?
Evaluation criteria

Overall Impact

Significance

Investigator

Innovation

Approach

Environment

Components not necessarily of equal weight
Evaluation criteria

Overall Impact.
Reviewers will provide an overall impact score to reflect their assessment of the likelihood for the project to exert a sustained, powerful influence on the research field(s) involved, in consideration of the following five core review criteria, and additional review criteria (as applicable for the project proposed).

Core Review Criteria.
Reviewers will consider each of the five review criteria below in the determination of scientific and technical merit, and give a separate score for each. An application does not need to be strong in all categories to be judged likely to have major scientific impact. For example, a project that by its nature is not innovative may be essential to advance a field.
Significance

Does the project address an important problem or a 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?

You, as the grant writer, need to make sure that it is obvious that these criteria are fulfilled
The investigator

Are the PD/PIs, collaborators, and other researchers well suited to the project?

If Early Stage Investigators or New Investigators, do they have appropriate experience and training?

If established, have they demonstrated an ongoing record of accomplishments that have advanced their field(s)?

If the project is collaborative or multi-PD/PI, do the investigators have complementary and integrated expertise; are their leadership approach, governance and organizational structure appropriate for the project?
Innovation

Does the application challenge and seek to shift current research or clinical practice paradigms by utilizing novel theoretical concepts, approaches or methodologies, instrumentation, or interventions?

Are the concepts, approaches or methodologies, instrumentation, or interventions novel to one field of research or novel in a broad sense?

Is a refinement, improvement, or new application of theoretical concepts, approaches or methodologies, instrumentation, or interventions proposed?
Approach

Are the overall strategy, methodology, and analyses well-reasoned and appropriate to accomplish the specific aims of the project?

Are potential problems, alternative strategies, and benchmarks for success presented?

If the project is in the early stages of development, will the strategy establish feasibility and will particularly risky aspects be managed?

If the project involves clinical research, are the plans for 1) protection of human subjects from research risks, and 2) inclusion of minorities and members of both sexes/genders, as well as the inclusion of children, justified in terms of the scientific goals and research strategy proposed?
Environment

Will the scientific environment in which the work will be done contribute to the probability of success?

Are the institutional support, equipment and other physical resources available to the investigators adequate for the project proposed?

Will the project benefit from unique features of the scientific environment, subject populations, or collaborative arrangements?
Other important considerations

Who are you writing to?
Agency, specific call, objective
Tailor your proposal

Who are you?
New vs established

Institutional support
Collaborators

Are you following the instructions?
Funded grants:

Address an important issue in novel ways

Has clearly stated goals and hypotheses

Will yield important information regardless of the experimental outcome

Is achievable within the cost and time frame

Is carried out by qualified investigators in a suitable environment

Samples of funded grants:
Everyday applications

Many of the criteria and much of the advise on grant writing also applies to

- planning and executing your research
- writing and publishing your research
- presenting your research in a seminar

Significance? Best approach? Possible outcomes? Pretend you are the reviewer
The *Mystery Novel* analogy

Tell them what you’re going to tell them, then tell them

Get feedback

From an expert in the field and from a non-expert
What is a hypothesis?

WikiAnswers: “It is an assumption written in a clear, concise manner about what you think will happen in your project. A good hypothesis will provide direction for your project and will help to keep your investigation focused. A hypothesis is to be stated simply and concisely. It is critical for your project and must be testable. Ultimately you will accept or reject your hypothesis.”

“An educated guess”

Testable

Different from a prediction

Alternatively, use questions
The writing process

Have a great idea!

Outline your aims

Write your research plan

Present your preliminary data

Reiterate $10^x$ times

Write the Background section

Reiterate …
Have great idea!

1. Select a topic that you are interested in writing a proposal for. Outline the following in writing (one sentence each):
   - Goals
   - Hypothesis
   - Aims

2. Write a short (less than 1/2 page) abstract that introduces the problem you want to address, its significance, and a brief explanation of the approach that you are proposing.

Due to classmate on September 29
Due to me (by email) October 6
Final grant format for BME 207

Time frame: 2 years
Single-spaced, 11 pt Arial or 12pt Times; 1” margins):

Specific Aims: 1 page max (including figures)
Research Strategy 6 pages max (including figures)
References: 20 max (not counted toward page limitations)
Dr. Gerloff:

**Protein Interactions I**

- Introduction to protein properties affecting interaction/recognition
- Recognition of “small molecules” (e.g. enzymes, hormone receptors)
- Recognition of nucleic acids: DNA-binding (e.g. transcription factors)

**Reading assignments:**