Bioinformatics and Computational Biology

Fall 2015

BCB Graduate Program

Introduction

www.bcb.iastate.edu
Staff Introductions

Dennis Lavrov  (dlavrov@iastate.edu) BCB Program Chair

Carolyn Lawrence-Dill (triffid@iastate.edu) BCB Associate Chair

Trish Stauble (tastaub@iastate.edu) BCB Program Coordinator
Program Overview

One of the first Bioinformatics Ph.D. programs in the US

With 50 Ph.D. students, one of the largest and strongest Bioinformatics Ph.D. programs in the US

About 15 core teaching faculty, but over 80 program-associated faculty (from more than 15 departments) with research projects in BCB

‘Wet’ and ‘dry’ lab research experiences and mentoring by a major and co-major professor (each in a different discipline)
Major Research Thrusts

Bioinformatics
Computational Molecular Biology
Structural and Functional Genomics
Macromolecular Structure and Function
Metabolic and Developmental Networks
Integrative Systems Biology
Information Integration and Data Mining
Biological Statistics
Mathematical Biology
Sources of funding

First Year – Research assistantship (RA) provided by program

Afterward – RA (typically) arranged with major professor

Teaching assistantships (typically) arranged with home department

Competitive fellowships funded by internal as well as external sources as available
Questions on funding?
Training timeline

Year 1. Research rotations, finding a home
Years 1-2. Core Curriculum

Year 2. Define dissertation project, additional coursework

Year 2-3. Preliminary examination

Year 5. Ph.D.

Progress monitored by the program - interviews with BCB Chair
Getting Started

Each BCB student is advised by a temporary advisor during the first year.

Temporary advisor helps choose courses, and arrange research rotations.

Dennis Lavrov and Carolyn Lawrence-Dill are the current temporary advisors---additional members of the Supervisory Committee may assist.

An important choice to make is Track 1 and Track 2.
Prerequisite coursework- Track 1 versus 2

New students are expected to have a solid undergraduate training in at least one of the foundation disciplines: biology, mathematics, computer science, or statistics.

New students often take prerequisite courses in computer science, statistics, or biology during the first year to complete their base training.

Some students may be prepared for the Core Course curriculum. In consultation with their advisor, they will register for the core courses immediately and are Track 1. If there are classes a student needs to be prepared for the Core, these students are Track 2.
Prerequisite coursework

Computer Science
  Programming (Com 227, 228)
  Discrete Mathematics (Com S 330)

Statistics
  Stat 341

Biology
  Genetics (Biol 313)
  Evolutionary Biology (Biol 315)

Mathematics
  Calculus and Differential Equations (Math 165, 166, 265)
Background coursework

Computer Science
Design and Analysis of Algorithms (Com 311)

Statistics
Empirical Methods for Computer Science (Stat 430)

Biology
Molecular Genetics (Gen 409)
Core course requirements

I  BCB 567  Fundamentals of Genome Informatics
II BCB 568  Advanced Genome Informatics
III BCB 569  Structural Genome Informatics
IV BCB 570  Computational Functional Genomics and Systems Biology
GDCB 511  Molecular Genetics
## Sample Course plans
### Well-prepared Students (Track 1)

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bioinformatics I</td>
<td>Bioinformatics II</td>
</tr>
<tr>
<td></td>
<td>Stat 430</td>
<td>GDCB 511 (or Com S 311)</td>
</tr>
<tr>
<td></td>
<td>Rotations</td>
<td>Rotations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Bioinformatics III</th>
<th>Bioinformatics IV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(Com S 311)</td>
<td></td>
</tr>
</tbody>
</table>
## Sample Course plans

**Students Missing Computer Science Prerequisites, but with strong Biology background (Track 2)**

<table>
<thead>
<tr>
<th>Year 1</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Com S 227</td>
<td>Com S 228</td>
</tr>
<tr>
<td></td>
<td>Stat 430</td>
<td>GDCB 511</td>
</tr>
<tr>
<td></td>
<td>Rotations</td>
<td>Com S 330</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rotations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year 2</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bioinformatics I</td>
<td>Bioinformatics II</td>
</tr>
<tr>
<td></td>
<td>Com S 311</td>
<td>Bioinformatics IV</td>
</tr>
</tbody>
</table>

| Year 3          |                       |                       |
|-----------------|                       |                       |
|                 | Bioinformatics III    |                       |
# Bioinformatics and Computational Biology

## Sample Course plans

### Students Missing Biology Prerequisites, but with strong Computer Science background (Track 2)

<table>
<thead>
<tr>
<th>Year</th>
<th>Fall</th>
<th>Spring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Biol 313</td>
<td>Gen409</td>
</tr>
<tr>
<td></td>
<td>BBMB 316</td>
<td>Bioinformatics II</td>
</tr>
<tr>
<td></td>
<td>Stat 430</td>
<td>Rotations</td>
</tr>
<tr>
<td></td>
<td>Rotations</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Bioinformatics I</td>
<td>GDCB 511</td>
</tr>
<tr>
<td></td>
<td>Bioinformatics III</td>
<td>Bioinformatics IV</td>
</tr>
</tbody>
</table>
Questions on Training Timeline or Coursework?
Finding a home

Take Faculty Research Seminar (BCB 691)
Arrange Research Rotations
Choose Major and Co-major Professors
Your major professor’s department becomes your home department.
Major and co-major professors are responsible for research supervision, mentoring, and assistantship support.
Arrange Research Rotations

- Rotations include ‘wet’ and ‘dry’ lab research experiences
- Goal of rotations is to help identify major and co-major professors (each in a different discipline)
- Rotations will be completed with submission of evaluation form
Research Rotation opportunities available with the following faculty:

- Dean Adams, Ecology, Evolution and Organismal Biology (EEOB)
- Ludovico Cademartiri, Material Science Engineering
- *Steven Cannon - Agronomy and USDA ARS
- Michael Cho - Biomedical Sciences

*Will present at the August 21st Event*
Research Rotation opportunities available with the following faculty:

- *Hui-Hsien Chou – Genetics, Development and Cell Biology (GDCB)
- Julie Dickerson – Electrical and Computer Engr.
- Philip Dixon - Statistics
- Drena Dobbs – GDCB
More Research Rotation opportunities available with following faculty:

• Oliver Eulenstein – Computer Science
• *Iddo Friedberg – Veterinary Microbiology and Preventive Medicine (VMPM)
• Xun Gu, GDCB
• *Tracy Heath, EEOB
• Eric Henderson - GDCB
More Research Rotation opportunities available with following faculty:

- Adina Howe – Ag and Biosystems Engineering
- Matt Hufford – EEOB
- Robert Jernigan – Biochemistry, Biophysics and Molec Biol
- Julie Kuhlman - GDCB
- Dennis Lavrov – EEOB
- Peng Liu - Statistics
More Research Rotation opportunities available with following faculty:

- Allen Miller – Plant Pathology and Microbiology
- *Tom Peterson – GDCB
- Jim Reecy – Animal Science
- Taner Sen – GDCB
- *Ravi Singh – Biomedical Sciences
And More -- Research Rotation opportunities available with following faculty:

- Stephan Schneider - GDCB
- Guang Song, Computer Science
- *Amy Toth, EEOB
- Jeff Trimarchi, GDCB
- *Chris Tuggle, Animal Science
- *Geetu Tuteja, GDCB
- Eric Underbakke, BBMB
And More -- Research Rotation opportunities:

- Nicole Valenzuela, EEOB
- Amy Vincent, USDA – ARS
- *Erik Vollbrecht - Genetics Development and Cell Biology
- *Justin Walley – Plant Pathology and Microbiology
- Steve Whitham – Plant Pathology and Microbiology
- Roger Wise – Plant Pathology and Microbiology
- *Eve Wurtele – GDCB
- Marna Yandeau Nelson, GDCB
Research Rotation Timetable

Deadline for submitting Rotation Planning form: Sept 10

Approximate dates for rotations:
- Rotation #1: Sept 14 – Oct 30
- Rotation #2: Nov 2 – Dec 18
- Rotation #3: Jan 11 – Feb 26

There is time for a 4th rotation:
- Feb 29 – April 15

Deadline for final lab decision: April 15
Deadline for filing Home Department form: May 1
Questions on research rotations and finding a home?
Bioinformatics and Computational Biology

Research and Dissertation

Research Rotations
Thesis proposal and Preliminary Examination
Research and journal and conference publications
Ph.D. Thesis
Thesis Defense
Additional training opportunities

Participation in scientific conferences and symposia
Internships
International experiences
Questions on Training Requirements?
History and Mission

• The Graduate College is one of Iowa State’s oldest academic divisions. It was founded in 1916 to support graduate study in the university’s land-grant areas of agriculture, engineering, home economics, and veterinary science. Within 10 years of its founding it grew from supervising 10 to 700 graduate students.

• While Iowa State did not award its first PhD until 1916, by 1950 the college had conferred no fewer than 1,000 doctorates, a figure that would rise to 5,000 by 1972 and 10,000 by 1991. This steadily accelerating pace in degrees awarded reflected the university’s recognition of the dynamic and inextricable relationship of graduate education to advanced research and innovation.

• Today the Graduate College is responsible for more than 110 distinct programs across the entire spectrum of the university’s schools and colleges, including interdisciplinary and certificate programs, as well as for coordinating academic programming between the university’s undergraduate and graduate divisions.
Resources – Graduate College

Professional Development

• **Individual Development Plan (IDP) to** provide a planning process that identifies your professional development needs and career objectives.
• **Regular professional development workshops** centered on core competencies; teaching, research, communication, career, and wellness
• ISU is a member of [CIRTL](http://cirtl.net) a consortium of 22 universities that makes available a broad range of online courses, webinars and discussions to prepare our graduate students to be better TAs and future faculty members.
Resources – Graduate College

Professional Development

• Leadership: The challenges our society is facing require a new generation of leaders who can build collaborations, work across disciplines, and forge stronger solutions from diverse perspectives. We are committed to developing these skills in graduate students and postdocs. Each year we gather a cohort of 20 young leaders in the Graduate College Emerging Leadership Academy (GC-ELA). Each cohort has broad career aspirations, industry, government, NGO, entrepreneur, and academia.

• We have one of the largest Preparing Future Faculty programs in the country. PFF prepares graduates for faculty careers through a combination of seminars, mentoring, and practical classroom and departmental service experiences.
Resources – Graduate College – website features info like:

Your Relationship with your major professor
• Critical for a successful experience in graduate school
• Find out and understand how your major professor operates
• With that knowledge, you can act in ways that complement your major professor’s work style or you may attempt to modify how your major professor interacts with you through:
  • Communication: Sharing concerns; seeking feedback on performance
  • Set Goals: make mutual concrete plans for each week, month, semester
  • Show Respect, but Challenge: Respectfully question advice or suggestions that don’t make sense
Resources

L.H. Baker Center for Bioinformatics and Biological Statistics
- Organizes faculty research
- Provides computer infrastructure
- Home to computer support staff
- Organizes campus-wide seminars and workshops

ISU Library – Heather Lewin, Science & Technology Librarian
http://instr.iastate.libguides.com/bcb
BCB program resources

BCBGSO
This student-led group coordinates many BCB activities and research opportunities. Get involved and benefit! Bekah Starks is the current president of the organization.

BCB Office
Trish can and does answer a lot of questions - I can help as well
Read through the BCB Graduate Student Handbook
Use the on-line version: www.bcb.iastate.edu/Handbook.html