

The banner features a dark background with a red ribbon structure on the left, a DNA double helix in the center, and various colored letters (G, C, A, G, T) and binary code (0s and 1s) scattered across the top right.

Bioinformatics and Computational Biology

Fall 2017

BCB Graduate Program

Introduction

www.bcb.iastate.edu



Bioinformatics and Computational Biology

Staff Introductions

Carolyn Lawrence-Dill, BCB Chair

Iddo Friedberg, Associate BCB chair

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



Bioinformatics and Computational Biology

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, with 76 program-associated faculty (from 18 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)



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Major Research Thrusts

Structural Bioinformatics

Comparative Genomics

Transcriptomics

Proteomics

Predictive Plant Phenomics

Metabolomics

Machine Learning

Image Processing

Biological Data Mining, modeling and analytics

Outcomes from the BCB Program

Over 100 BCB alums have positions spanning the gamut including:

- 15 tenure-track professors
- 40 in postdoctoral or research associate positions
- 40 in industry – biotech start-ups, pharmaceutical or agricultural
- 5 in government positions



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Examples of outcomes for BCB Alums

- Professor at Texas A&M Univ; College Station in Poultry Science
- Bioinformatics Director at Collaborative Health Initiative Research Program (CHIRP), Uniformed Services Univ., Bethesda, MD
- Staff Scientist, Roswell Park Cancer Inst; Buffalo NY
- Research Scientist; Dana Farber Cancer Inst., Boston
- Senior Research Associate at Oregon Health and Science University/Visiting Scientist at Fred Hutchinson Cancer Research Center

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



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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

Carolyn Lawrence-Dill is the current temporary advisor---additional members of the Supervisory Committee may assist



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Background coursework requirements

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 take background courses in computer science, statistics, or biology during the first year to complete their basic training.

In consultation with their advisor, they will register for the courses which will best prepare them for the Core Curriculum.



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Background coursework

Computer Science

Programming and Data Structures (Com 227, 228)

Discrete Computational Mathematics (Com S 230)

Statistics

Stat 341, 342 or Stat 401, 447, or 430

Biology

Genetics (Biol 313)

Evolutionary Biology (Biol 315)

Mathematics

Calculus and Differential Equations (Math 165, 166, 265)

Linear Algebra



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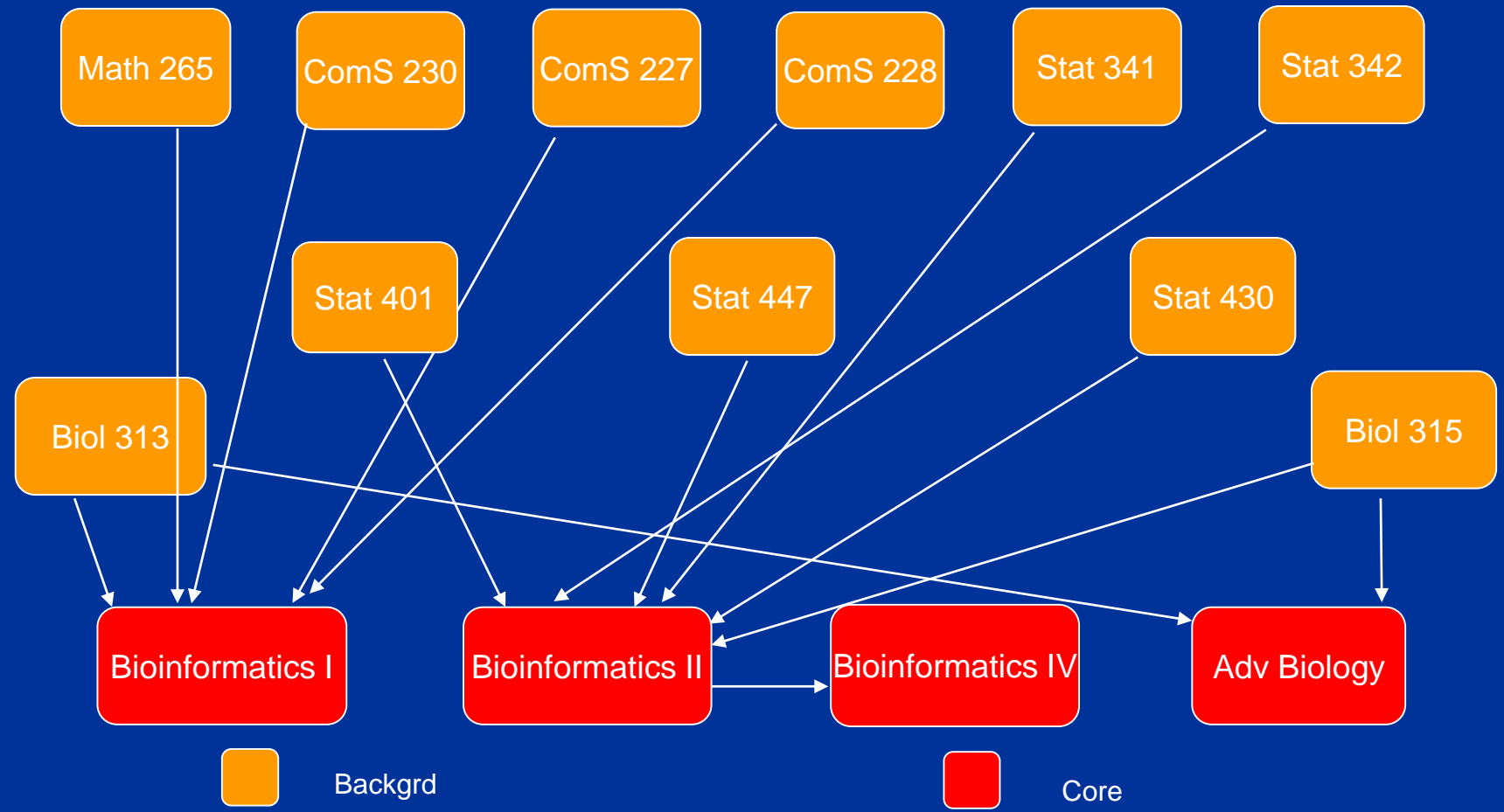
Core course requirements

- | | | |
|----|---------|----------------------------|
| I | BCB 567 | Bioinformatics Algorithms |
| II | BCB 568 | Statistical Bioinformatics |
| IV | BCB 570 | Systems Biology |

Advanced Biology Requirement - Examples include:

- | | |
|------------------|---|
| GDCB 511 | Molecular Genetics |
| AnSci 556 | Current Topics in Genome Analysis |
| EEOB 561 | Evolutionary and Ecological Genomics |
| EEOB 563 | Molecular Phylogenetics |

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Bridge course requirements for First Year Students

Required: 4-6 full courses depending on student's background

Statistics: 1-2 STAT courses

If not taken already, students must take **either** STAT 430 (if enough math background) or STAT 401 in fall followed by STAT 447 in spring (note that STAT 447 course number will soon be changing to 500 level)

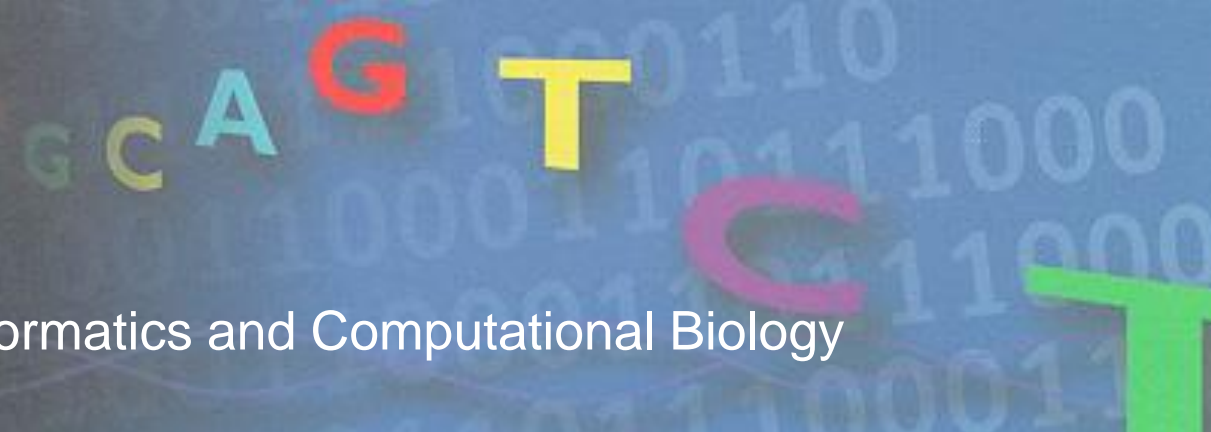
Computer Science: 2-3 COMS

If not taken already, students must take COMS 228 in fall and COMS 230 in spring (if enough computer science background)

If students are not ready to take COMS 228, they should first take COMS 227 (fall) and then take COMS 228 and COMS 230 concurrently in the spring

Biology: 2 BIOL courses

If not taken already, students must take BIOL313 (Genetics) and BIOL315 (Evolution) (both are offered in fall and spring).



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Sample Course Plans For new students

Year 1

Fall

Biology 313
ComS 227/228
Stat 401/430
Faculty Seminar
Rotations

Spring

Biology 315
ComS 228/230
BCB II (after Stat 430)
or Stat 447
Rotations

Year 2

Bioinformatics I
Adv Elective Req

Bioinformatics II
Bioinformatics IV



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Sample Course plans

Students Needing ComS or Stat Background, but with strong Biology background

Year 1

Fall

Com S 227

Stat 401

Faculty Seminar

Rotations

Spring

Com S 228

Stat 447

Com S 230

Rotations

Year 2

Fall

Bioinformatics I

Adv Elective Req

Spring

Bioinformatics II

Bioinformatics IV

Year 3

Adv Biol Req

Adv Elective Req



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Sample Course plans

Students Missing Biology Prerequisites, but with strong
Computer Science background

Year 1

Fall

Biol 313

Stat 430

Faculty Seminar

Rotations

Spring

Biol 315

Bioinformatics II

Rotations

Year 2

Bioinformatics I

Adv Electives

Adv Electives

Bioinformatics IV



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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 for Fall 2017:

- Ludovico Cademartiri, Materials Science and Engineering
- Julie Dickerson, ECPE
- Oliver Eulenstein, Computer Science
- David Fernandez-Baca, Computer Science
- Iddo Friedberg, VMPPM
- Xun Gu, GDCB
- Eric Henderson, GDCB

More Research Rotation opportunities available with following faculty:

- Richard Honzatko - BBMB
- Adina Howe – Agricultural and Biosystems Engineering
- Robert Jernigan – BBMB
- Crystal Lu – EEOB
- Jonathan Mochel – BMS
- Walter Moss - BBMB

More Research Rotation opportunities available with following faculty:

- Gregory Phillips – VMPPM
- Ravi Singh – BMS
- Jonathan Smith – Math
- Guang Song – Computer Science
- Christopher Tuggle – Animal Science
- Nicole Valenzuela - EEOB

More Research Rotation opportunities available with following faculty:

- Eric Vollbrecht – GDCB
- Justin Walley – Plant Path and Microbiology
- Lizhi Wang - IMSE
- Zhijun Wu - Mathematics

Research Rotation Timetable

Deadline for submitting Rotation Planning form	Sept 8
Approximate dates for rotations:	
Rotation #1	Sept 12 – Oct 30
Rotation #2	Oct 31 – Dec 16
Rotation #3	Jan 9 – Feb 24
There is time for a 4 th rotation:	Feb 27 – April 13
Deadline for final lab decision	April 13
Deadline for filing Home Department form	April 28



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Questions on research rotations and finding a home?



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Research and Dissertation

Research Rotations

Thesis proposal and Preliminary Examination

Research and journal and conference publications

Ph.D. Thesis

Thesis Defense

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Additional training opportunities

Participation in scientific conferences and symposia

Internships

International experiences

A graphic header for a bioinformatics presentation. On the left, a red ribbon structure represents a protein. In the center, the letters G, C, A, G, T are displayed in various colors (green, yellow, red, cyan, yellow) against a blue background with binary code (0s and 1s) and a faint DNA double helix. On the right, a large green letter 'T' is partially visible.

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Questions on Training Requirements?

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](#) 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 for Professional Development Graduate College

- Center for Excellence in Learning and Teaching
- Preparing Future Faculty
 - 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.
- Center for Communication Excellence
- Writing a Teaching Philosophy Statement
- Learn @ ISU



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Resources

Biology IT

- Collaboration with the colleges of Life Sciences and Agriculture
- Work closely with the University's Information Technology group
- Provides access to computational hardware, software
- Have high performance network attached storage
- Collaborate/consult with researchers on complex technology problems

ISU Library – Heather Lewin, Science & Technology Librarian

<http://instr.iastate.libguides.com/bcb>



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BCB program resources

BCBGSO

This student-led group coordinates many BCB activities and research opportunities. Get involved and benefit! The current president of the organization is Alvin Chon.

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