Masters of Arts in Biology

January 18th, 2017

Elizabeth O. Harrington, Ph.D.
Associate Dean, Office of Graduate & Postdoctoral Studies
Division of Biology & Medicine
Masters of Arts in Biology

• Established in 1993 via contractual agreement.

• Accredited by Connecticut Department of Education.

• Course offering is a section of an existing Brown University course.
Masters of Arts in Biology

• “The quality of student performance required is at least as rigorous as for the Master of Arts degree within any Graduate Program in the Division.

• The difference is the Pfizer students obtain breadth in Biology in more than one graduate area by not imposing strict requirements for specific courses.”
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Objectives

• Provide graduate instruction within the biological sciences for Pfizer colleagues and contractors who wish to extend their knowledge in discrete areas relating to their employment and/or interests.

• Provide a broad-based and rigorous Master of Arts training in biological sciences.
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Experiences

Over 180 M.A. in Biology awarded.
Masters of Arts in Biology

Experiences

Some have gone on to higher degrees....
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Overview

• Open to Pfizer contractors and colleagues.

• Only one prerequisite required:
  • *A Bachelors degree in any field.*

• All courses held on-site at Pfizer-Groton campus and available via WebEx for offsite employees.
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Overview

• Pfizer employees and contractors register as Special Students via a Registration Form;
  • Standard Brown tuition fees apply.

• Students apply to Graduate School for the M.A. program after successful completion of two courses.

• Pfizer reimburses colleagues only who pass with grade of a ‘C’ or better.
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Program Requirements

- 8 graduate courses:
  - 2 of 8 courses in “core” subjects
    - cell biology,
    - biochemistry,
    - genetics,
    - pharmacology;
  - 6 of 8 courses with grade of ‘B’ or better.

- Passing final paper or proposal “culminating experience” on topic approved by Assoc Dean, Graduate & Postdoctoral Studies.
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Program Requirements: Culminating Experience

• As a culminating experience for the Master of Arts in Biology Program, there are two options:
  • an NIH style research proposal based on an original hypothesis or
  • a final paper which, based on the course work taken by the student, represents an original in-depth analysis and literature review of a problem in modern biology.
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Program Requirements: Culminating Experience

• **Research proposal** (written as though you were preparing a NIH RO1 application) will include:
  • project summary/abstract,
  • specific aims,
  • research strategy,
  • literature cited.

• **Final paper** (10-15 pgs, excluding figures and references) will include:
  • introduction,
  • discussion,
  • conclusion,
  • literature cited.
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Program Requirements: Culminating Experience

• Topics must be discussed with, and approved by the Associate Dean for Graduate and Postdoctoral Studies.

• The final project may be undertaken following completion of 7 courses, but must be completed no later than one semester following completion of the 8th course.
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Program Requirements: Culminating Experience

• Both projects are designed to demonstrate the student's ability to master and integrate the knowledge gained in the prior course work and to apply that knowledge to a specific problem in modern biology.
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*Program Requirements*

- No courses can be transferred from another institution.
- Must be actively employed as a colleague or contractor at Pfizer.
- Pfizer M.A. students may take courses toward the degree on Brown University campus with permission of instructor and Assoc. Dean of Graduate and Postdoctoral Studies.
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Program Requirements

• Once accepted by the Graduate School, the students are expected to enroll in courses continuously each semester;
  • with the exception of the summer term.
  • If not, a request for a Leave of Absence (LOA) must be submitted one month prior to the start of the term via the Graduate School to avoid billing.
  • Only one LOA is permissible during the course of study.
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Application Requirements

• Successful completion of two Brown University graduate courses (B or better).

• Undergraduate transcript with date of degree.

• Letter of recommendation from Supervisor at Pfizer.

• 1-2 pg. Colleague Statement

• No GRE requirement!
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Auditing of Classes

• **Auditing.** is a student who is registered in a course without earning academic credit upon successful completion under the following conditions:
  – (1) the student must be properly registered for it;
  – (2) the student is entitled to all instruction in the course, including conferences; but will not receive criticism of papers, tests, and examinations.

• Auditing of courses is available only to Pfizer students who have graduated with the Brown/ Pfizer MA degree.

• All other Pfizer students are required to enroll in the course.
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Auditing of Classes

• Auditing of courses is limited to a total of 2 courses per Brown/ Pfizer MA graduate.

• To audit a BROWN course, the student must receive permission from the instructor prior to the start of the course.
  – The audited course shall be entered on the permanent record of any student electing this privilege.
  – The status of a course in which a student has registered may not be changed from audit to credit at any time.

• Auditing of a course will be at no cost to the student.
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Upcoming Courses

• Spring 2015:  *Human Physiology*

• Fall 2015:  *Physiological Pharmacology*
  
  • **Core course**

• Spring 2016:  *Developmental Biology*

• Fall 2016:  *Cancer Biology*

• Spring 2017:  *Molecular Genetics*
  
  • **Core course**

• Fall 2017:  *Virology*
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**Previous Courses**

- Advanced Biochemistry,
- Advanced Microbiology,
- Cancer Biology,
- Cell Biology,
- Developmental Biology,
- Drug Delivery,
- Human Physiology,
- Introduction to Epidemiologic Research Methods
Questions?
Molecular Genetics

Instructors:
Mark Johnson, Ph.D.
Associate Professor of Biology

Richard Freiman, Ph.D.
Associate Professor of Medical Sciences
Molecular Genetics (BIOL 2540)

Course Objective

Understand how ‘Molecular Genetics’ is currently being used to discover how cells and organisms work

Emphases:

• Understanding the primary literature in this area
• Relevance to treatment of human disease
• Cancer genomics
Molecular Genetics (BIOL 2540)

Course Focus

Model Organisms and how they have been used to understand basic biological mechanisms

Levels of biology:
Cellular
Developmental
Biochemical
Molecular Genetics (BIOL 2540)

Model Organisms

Saccharomyces cerevisiae

Drosophila melanogaster

Caenorhabditis elegans

Mus musculus

Arabidopsis thaliana
Molecular Genetics (BIOL 2540)

Model Organisms

Characteristics Model organisms:

Sequenced genomes

Sophisticated genomics tools

Small size, rapid life cycle

Many years of focused genetic analysis
Molecular Genetics (BIOL 2540)

Topics

Classical Genetics

Genes and Genomes

Design of the genetic screen

Map-based cloning

Genome-scale reverse-genetic analysis

Human Genetics

Cancer Genomics

Genome Engineering
Molecular Genetics (BIOL 2540)

*Instructors*

**Richard N Freiman**
richard_freiman@brown.edu
http://research.brown.edu/my research/Richard_Freiman
Associate Professor of Medical Science
Molecular Biology, Cell Biology, and Biochemistry
Box G-E
Brown University
Providence, RI 02912-G,

**Mark A Johnson**
mark_johnson_1@brown.edu
http://www.brown.edu/pollen
Associate Professor of Biology
Molecular Biology, Cell Biology, and Biochemistry
Box G-L
Brown University
Providence, RI 02912-G,
Molecular Genetics (BIOL 2540)

Participants (students)

background knowledge in genetics

coursework in one other area of biology or biochemistry

we will cover background material during each of our discussion sessions

\textit{desire to learn how molecular genetics leads to gene discovery and understanding of gene function}
Molecular Genetics (BIOL 2540)

A typical class

Thursdays 3:00 pm – 6:00 pm

1/3 – lecture/discussion on basic concepts with support from text book

1/3 – lecture/discussion on specific concepts required to understand assigned reading

1/3 - discussion of assigned reading
Molecular Genetics (BIOL 2540)
Weekly Reading assignments

Background Reading
1 – 2  Chapters from Text (mainly for review)
and/or
1 – 2  Review articles (when the text isn’t useful)

Primary Literature
1-2  Primary literature papers
Molecular Genetics (BIOL 2540)
Schedule for weekly meetings

First Meeting = 1/26 Course Introduction, Introduction to instructors

Six Weekly meetings

Exam 1 = 3/16

Six Weekly meetings (no meeting 3/30, Brown Spring Break)

Exam 2 = 5/11
Introduction to Genetic Analysis 10th Edition (“Griffiths”)
ISBN: 978-1-4292-2943-8
Griffiths, Wessler, Carroll, Doebley
Published by WH Freeman.
Molecular Genetics (BIOL 2540)  
**Assessments**

Exams  (200 points total, during class meetings)

- Exam I  
  - Date: 3/16  
  - Points: 100
- Exam II  
  - Date: 5/11  
  - Points: 100

Quick Article Critiques  
- Frequency: weekly (10)  
- Points: 100
Molecular Genetics (BIOL 2540)

Grades

Final Grades will be calculated out of a total of 300 points.

Grades will be determined as follows:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>85% (255 points)</td>
</tr>
<tr>
<td>B</td>
<td>70% (210 points)</td>
</tr>
<tr>
<td>C</td>
<td>55% (165 points)</td>
</tr>
</tbody>
</table>
Molecular Genetics (BIOL 2540)
we’re available

Reach us by e-mail:
richard_freiman@brown.edu
mark_johnson_1@brown.edu

We will answer questions after each discussion and online via canvas
Virology

Instructors:

Peter R. Shank, Ph.D.
Emeritus Professor of Medical Science

Amanda Jamieson, Ph.D.
Assistant Professor of Medical Science

TA: Meredith Crane, Ph.D.
Postdoctoral Associate
Why study Viruses?

• There are a lot of them.
  – The total estimate of virus particles in the world is $10^{31}$. That’s a very big number!
  – If the average virus has a diameter of 100 nM and they were stacked on one another they would reach ca. $10^5$ light years (i.e. $10^3$ times the diameter of the Milky Way!).

• We know far less about viruses than other types of microorganisms and new agents are being discovered frequently.
  – This point is illustrated by a 2012 report in Science by Philippe et al., describing a newly isolated class of viruses termed Pandoraviruses.
    – These viruses, isolated of Chile and a pond in Australia, are ca. 1µM in diameter containing a genome of 2.5Mb.
    – Of the 2,556 predicted proteins encoded by this virus 93% have no homolog in any existing databases thus defining a totally novel life form.
Why study viruses?

• Some viruses make people sick
  – Upper respiratory infection is the most common infection of humans (ca. 5 per year) the vast majority are caused by viruses

• Recent years have brought a number of new or newly emerging viruses including SARS, MERS, Zika, West Nile virus, Dengue and Ebola among others.

• Most of these viruses are zoonoses i.e., transmitted to humans from other animals
Why study viruses?
The effect of the 1918 Flu in the US
Influenza is not an innocuous disease

- CDC data suggest that over the last 30 years ca. 23,000 typically die each year

- In 1918 ca. 50 million people died from flu world-wide including 650,000 in the US

- The virus infects humans, swine, birds, horses, and several other animals and is transmitted between animals and humans

- The CDC weekly publishes a report on the status of flu in the US called Flu View
Pneumonia and Influenza Mortality from the National Center for Health Statistics Mortality Surveillance System
Data through the week ending December 17, 2016, as of January 4, 2017
Number of Influenza-Associated Pediatric Deaths by Week of Death: 2013-2014 season to present

- **2013-2014**: Number of Deaths Reported = 111
- **2014-2015**: Number of Deaths Reported = 148
- **2015-2016**: Number of Deaths Reported = 89
- **2016-2017**: Number of Deaths Reported = 0
Weekly Influenza Activity Estimates Reported by State & Territorial Epidemiologists*

Week ending December 31, 2016 - Week 52

* This map indicates geographic spread & does not measure the severity of influenza activity.
What about Ebola in 2013-5?

- WHO as of 2/28/16:
  - 28,639 cases, 11,316 deaths from Ebola virus (including ca. 500 health care workers)
  - All prior outbreaks totaled less than 2,000 cases

- Cases reported in West Africa late 2013, laboratory confirmed March 2014

- WHO declared health risk August 8, 2014 (almost a year after the first reported cases)

- Data suggest the virus persists in the eye, CNS, testes, and mammary glands for long periods of time in survivors
Chikungunya epidemic on Reunion Islands, France (2005-2006)

- Infection was “imported” in April 2005 from the epidemic in Comoro islands
- By April 2006, 244,000 cases of chikungunya were reported out of a population of 770,000 people
  - 123 severe cases
  - 41 cases of maternal-neonatal transmission
- 203 confirmed deaths due to chikungunya
- Following this, the epidemic spread to India. Almost 1.3 million suspected chikungunya fever cases were reported in India
- In 2013 India reported 18,639 chikungunya cases.
Yet Another Threat: 
Zika Virus

Latest in the line of flaviviruses that’s threatening the Western hemisphere
  – Dengue in 1990s
  – West Nile Virus in 1999
  – Chikungunya (mosquito borne alphavirus) in 2013

Now Zika virus!
  – First described in Uganda in the mid 1940s
  – Major outbreak in Brazil and Puerto Rico now spread via mosquitoes in Florida and Texas
  – Recent data suggest prior exposure to Dengue makes Zika worse and that the virus persists for at least two months following infection
VIROLOGY: Course Goals

• To gain understanding of molecular mechanisms of viral pathogenesis.
  – We will begin with a general introduction to the field of virology and then focus on the biology of specific viruses that are associated with human disease.
  – Lectures will include material from the current literature.
  – At the end of the course you should have an understanding of the major human viral pathogens and the vaccines and treatments used to prevent viral diseases.
<table>
<thead>
<tr>
<th>GROUP</th>
<th>FAMILY</th>
<th>EXAMPLES</th>
<th>GENOME SIZE (~)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (ds DNA)</td>
<td>Papillomaviruses</td>
<td>HPVs</td>
<td>8 Kbp</td>
</tr>
<tr>
<td></td>
<td>Adenoviruses</td>
<td>Adenoviruses</td>
<td>40 Kbp</td>
</tr>
<tr>
<td></td>
<td>Herpesviruses</td>
<td>HSV-1, EBV, CMV</td>
<td>130 - 230 Kbp</td>
</tr>
<tr>
<td></td>
<td>Poxviruses</td>
<td>Smallpox (Variola)</td>
<td>150 - 250 Kb</td>
</tr>
<tr>
<td>II. (ss DNA)</td>
<td>Parvoviruses</td>
<td>Parvovirus B-19</td>
<td>5 Kb</td>
</tr>
<tr>
<td>III. (ds RNA)</td>
<td>Reoviruses</td>
<td>Rotavirus</td>
<td>22 Kbp (11 pieces)</td>
</tr>
<tr>
<td>IV. (+ ss RNA)</td>
<td>Picornaviruses</td>
<td>Poliovirus, Rhinoviruses, HAV</td>
<td>8 Kb</td>
</tr>
<tr>
<td></td>
<td>Coronaviruses</td>
<td>SARS</td>
<td>29 Kb</td>
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<tr>
<td></td>
<td>Togaviruses</td>
<td>Sindbis, EEE, WEE Rubella</td>
<td>12 Kb</td>
</tr>
<tr>
<td></td>
<td>Flaviviruses</td>
<td>Yellow Fever, West Nile, Hep. C</td>
<td>10 Kb</td>
</tr>
<tr>
<td>V. (- ss RNA)</td>
<td>Rhabdoviruses</td>
<td>Rabies</td>
<td>11 Kb</td>
</tr>
<tr>
<td></td>
<td>Paramyxoviruses</td>
<td>Measles and Mumps</td>
<td>14 Kb</td>
</tr>
<tr>
<td></td>
<td>Orthomyxoviruses</td>
<td>Influenza A and B</td>
<td>12 Kb (8 pieces)</td>
</tr>
<tr>
<td></td>
<td>Bunyaviruses</td>
<td>Hantavirus</td>
<td>18 Kb (3 pieces)</td>
</tr>
<tr>
<td></td>
<td>Arenaviruses</td>
<td>Lassa Fever, LCMV</td>
<td>12 Kb (2 pieces)</td>
</tr>
<tr>
<td></td>
<td>Filoviruses</td>
<td>Ebola and Marburg</td>
<td>19 Kb</td>
</tr>
<tr>
<td>VI. (RNA rev. trans.)</td>
<td>Retrovirusse</td>
<td>HIV and HTLV</td>
<td>10 Kb</td>
</tr>
</tbody>
</table>
Evaluation

- There will be one in-class exam based on material from lectures 1-6 worth 100 points.

- There will be 10 online quizzes based on the assigned papers worth 10 points each.

- There will be an in-class final worth 150 points focusing primarily (but not exclusively) on lectures 7-13.
Why is this Man Smiling?
Some said:

• He thought there was something other than flu vaccine in the syringe......

• Actually Dr. Shank was so happy that he was going to get to teach virology again at Pfizer!
Who is this?
Craig Mellow

- **Nobel Laureate**
  - 2006 for Physiology and Medicine
- **Brown graduate**
  - Class 1982 B.S.
- **Ph.D.**
  - Harvard 1990
- **When did he take Virology at Brown?**
  - Spring of 1981
- **How did he do?**
  - He received an “A”
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How to get started?

1. Register for course offering via the Brown website:
   http://www.brown.edu/pfizer

2. Educational Assistance:
   - Colleagues: Apply for via HR source. Following the successful completion of the course (‘C’ or better), you will be reimbursed by Pfizer to pay off your loan.
   - Contractors: None available, but Ledge Light credit union has individual educational loan options.
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*How to get started???

3. Mail tuition check to:

Brown University Cashier's Office
164 Angell Street
Box 1911
Providence, RI 02912
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*Pfizer Contact*

- **Katelyn Stachelek**
  - Pfizer Global R&D; Groton Labs
  - Office:

- **TBD**
  - Pfizer; Cambridge Labs
  - Office:
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• Good luck!!