



# Master of Arts in Biology

January 9<sup>th</sup>, 2024

**Elizabeth O. Harrington, Ph.D.**  
*Associate Dean, Office of Graduate Studies*  
*Division of Biology & Medicine*

# Master of Arts in Biology

- Established in 1993 via contractual agreement.
- Course offering is a section of an existing Brown University course.



# Master of Arts in Biology

## *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.



# Master of Arts in Biology

## *Experiences*



Over **200** M.A. in Biology awarded.

# Master of Arts in Biology

## *Experiences*

- Many colleagues have remained with Pfizer with advancement within your organization.
- Others have earned additional master's or PhD degrees.





# Master of Arts in Biology

## *Overview*

- Open to Pfizer contractors and colleagues.
- Only one prerequisite required:
  - *A Bachelors degree in any field.*
- All courses available via WebEx.



# Master of Arts in Biology

## *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 'B' or better.
- Students must comply with Academic code and Title IX training (on-line)



# Master of Arts in Biology

## *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.





# Master of Arts in Biology

## *Program Requirements: Culminating Experience*

- **PURPOSE:** This requirement is designed for the student to demonstrate their ability to integrate the knowledge gained in the prior course work and to apply that to a specific problem in modern biology.



# Master of Arts in Biology

## *Program Requirements: Culminating Experience*

### Research proposal

*Research grant to include:*

- project summary/abstract,
- specific aims,
- research strategy,
- literature cited

### Final paper

*Paper to include:*

- introduction,
- discussion,
- conclusion,
- literature cited

*Each are to be 10-15 pages, excluding figures, graphs/ charts, and literature cited.  
Additional details are provided each year regarding font size, margins, etc.*



# Master of Arts in Biology

## *Program Requirements: Culminating Experience*

- Topics: must be approved by the Associate Dean for Graduate Studies.
- When due: may be undertaken following completion of 7 courses, but completed no later than one semester following completion of the 8<sup>th</sup> course.



# Master of Arts in Biology

## *Program Requirements*

- No course credits towards the degree may be transferred.
- 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.



# Master of Arts in Biology

## *Program Requirements*

- Once accepted by the Graduate School, the students are expected to enroll in courses *continuously each semester*;
  - No classes offered during 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.*



# Master of Arts in Biology

## *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!*





# Master of Arts in Biology

## *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.



# Master of Arts in Biology

## *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.



# Master of Arts in Biology

## *Upcoming Courses*

- Fall 2023: *Virology*
- Spring 2024: *Immunology*
- Fall 2024: *Advanced Biochemistry*
  - » **Core course**
- Spring 2025: *TBD*



# **BIOL2530**

## **Immunology**

**Spring 2024**

**Online, synchronized  
course**

**1x / week for 14 weeks**

**3 hours**



# Teaching team



Instructor: Aisling Dugan, Ph.D.



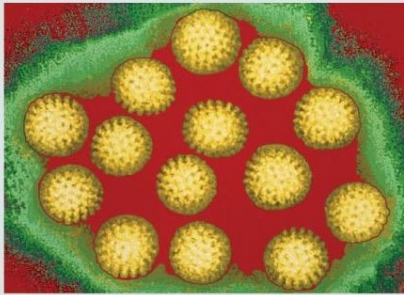
# The Immune System



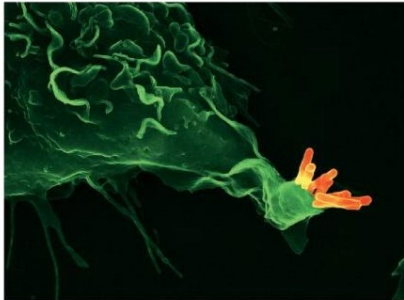


# Role of the Immune System

**Viruses** *Rotavirus*

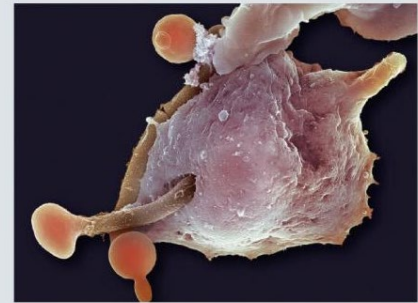


**Bacteria** *Mycobacterium tuberculosis*



- Recognize self vs. foreign
  - Pathogens
  - Toxins/chemicals/particulates
  - Cancer
- Removal of self
  - Damaged & dying cells
  - Remodeling & development

**Fungi** *Candida albicans*



**Parasites** *Filaria*

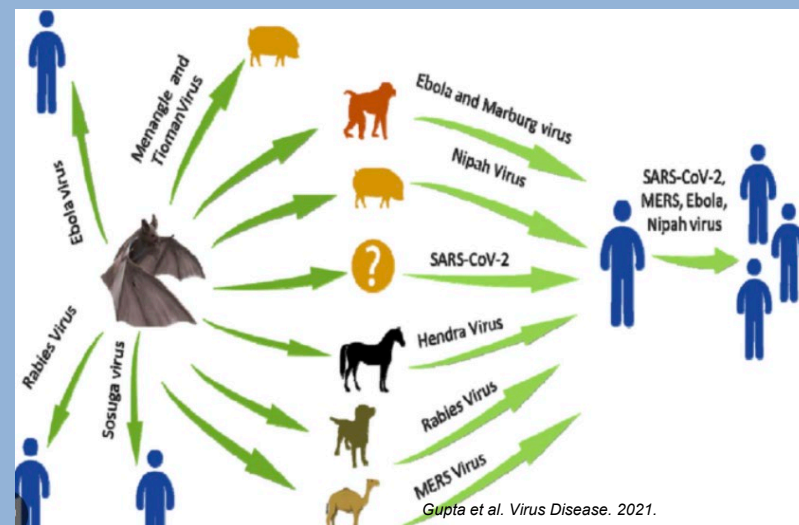




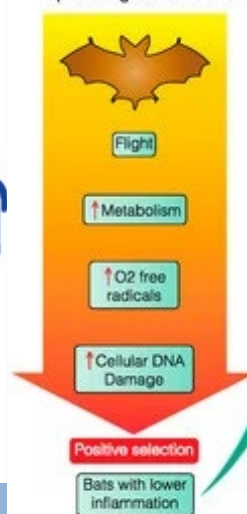
# Novel Insights Into Immune Systems of Bats

Arinjay Banerjee<sup>1</sup>, Michelle L. Baker<sup>2</sup>, Kirsten Kulcsar<sup>3</sup>, Vikram Misra<sup>4</sup>, Raina Plowright<sup>5</sup> and Karen Mossman<sup>1\*</sup>

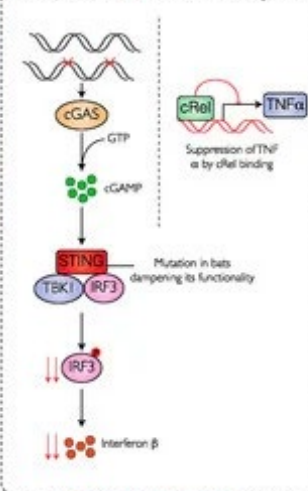
<sup>1</sup> Department of Pathology and Molecular Medicine, Michael DeGroote Institute for Infectious Disease Research, McMaster Immunology Research Centre, McMaster University, Hamilton, ON, Canada, <sup>2</sup> Health and Biosecurity Business Unit, Australian Animal Health Laboratory, CSIRO, Geelong, VIC, Australia, <sup>3</sup> Department of Microbiology and Immunology, University of Maryland School of Medicine, Baltimore, MD, United States, <sup>4</sup> Department of Veterinary Microbiology, Western College of Veterinary Medicine, University of Saskatchewan, Saskatoon, SK, Canada, <sup>5</sup> Department of Microbiology and Immunology, Montana State University, Bozeman, MT, United States



## Impact of flight on evolution

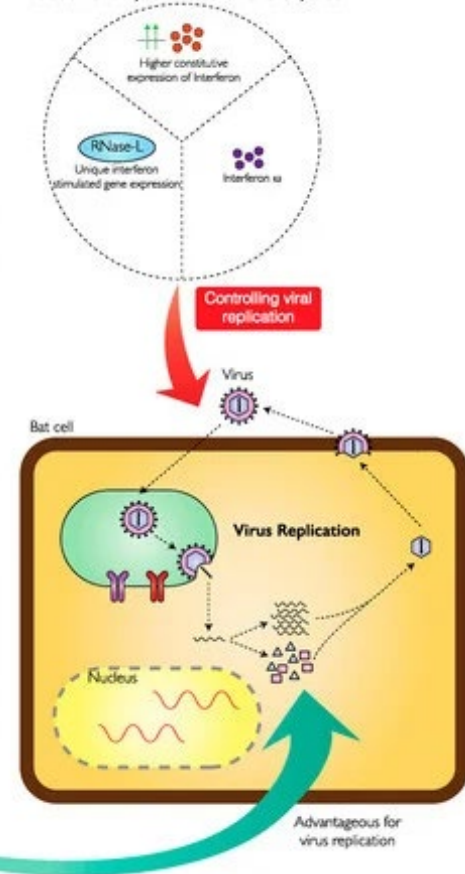


## Evolution of a tolerant immune response



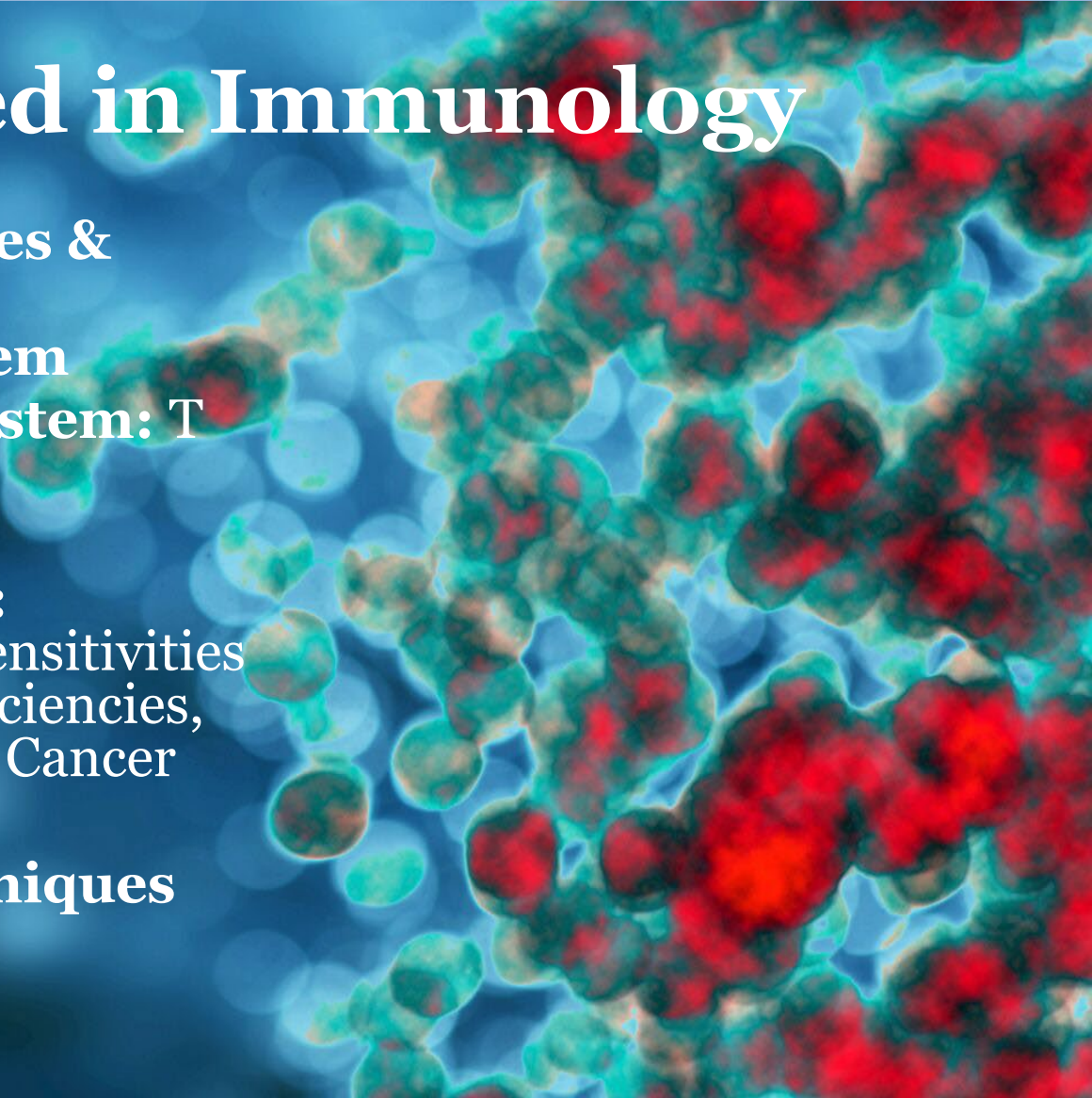
Reduced inflammation

## Evolution of unique antiviral immune response

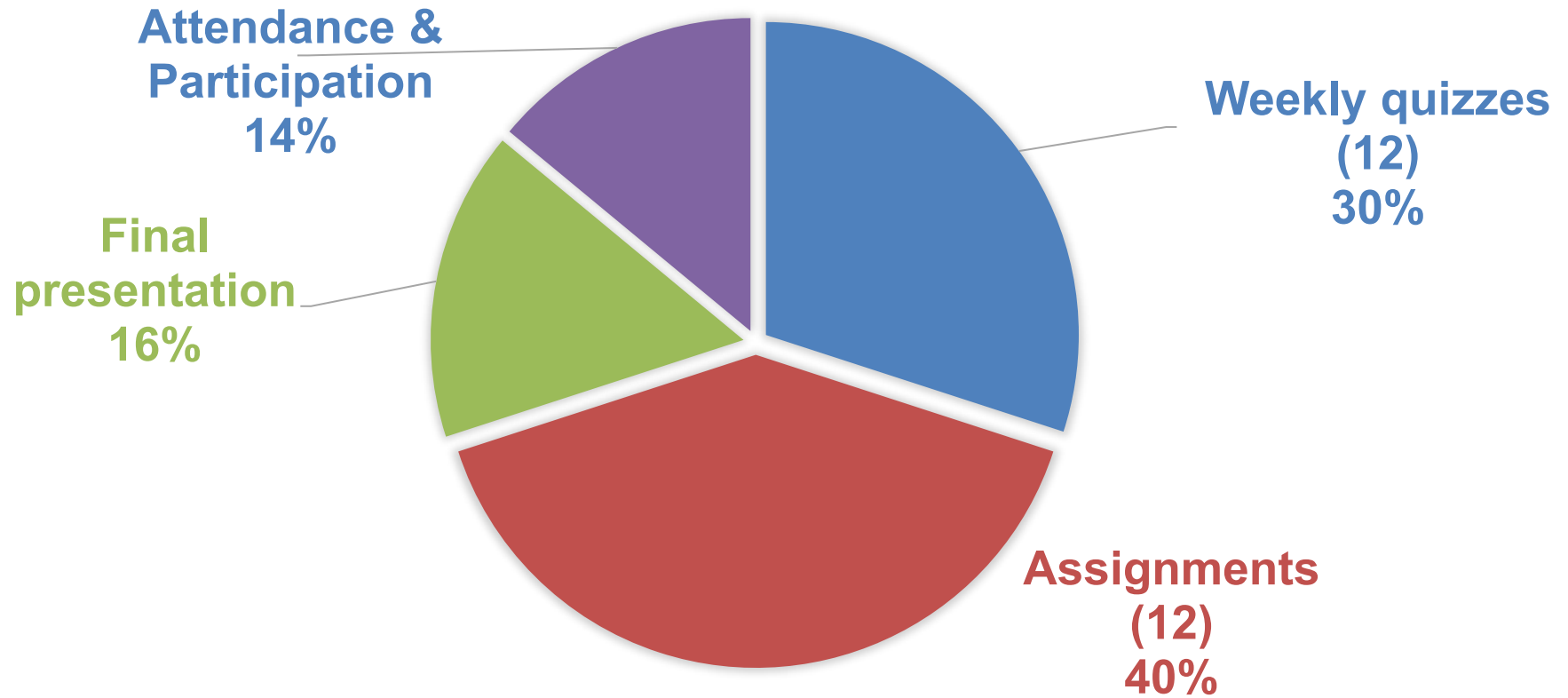


# Topics covered in Immunology

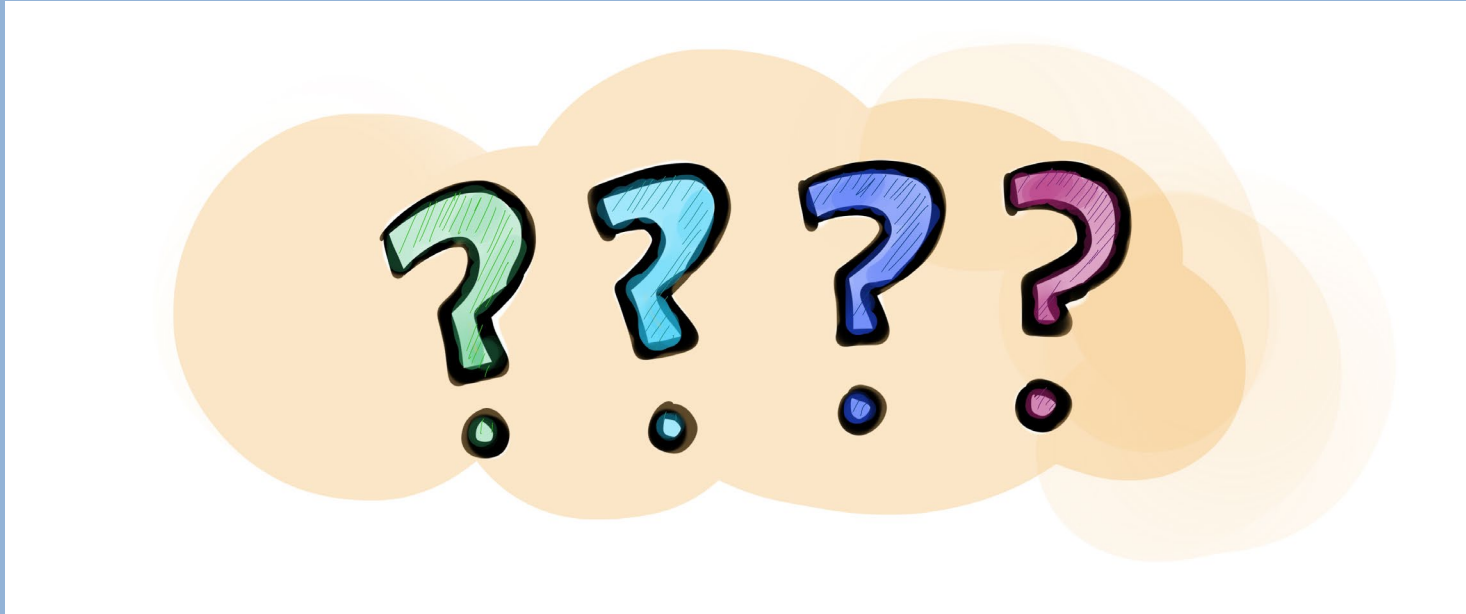
- **Anatomical structures & organs**
- **Innate immune system**
- **Adaptive immune system: T cells and B cells**
- **Infectious Disease**
- **Immune Conditions:**  
Autoimmunity, Hypersensitivities (allergies), Immunodeficiencies, Organ Transplantation, Cancer
- **Treatments**
- **Applications & Techniques**
- **Diversity**



## GRADING







Aisling\_dugan@brown.edu

**BIOL 2270 So2**  
**Advanced Biochemistry**

Gerwald Jogl, PhD  
Gerwald\_Jogl@brown.edu



# What do you associate with biochemistry?

- Amino acids, proteins
- Nucleic acids, DNA, RNA
- Metabolism, citric acid cycle
- Catabolic and anabolic pathways

# De novo design of protein structure and function with RFdiffusion


<https://doi.org/10.1038/s41586-023-06415-8>

Received: 14 December 2022

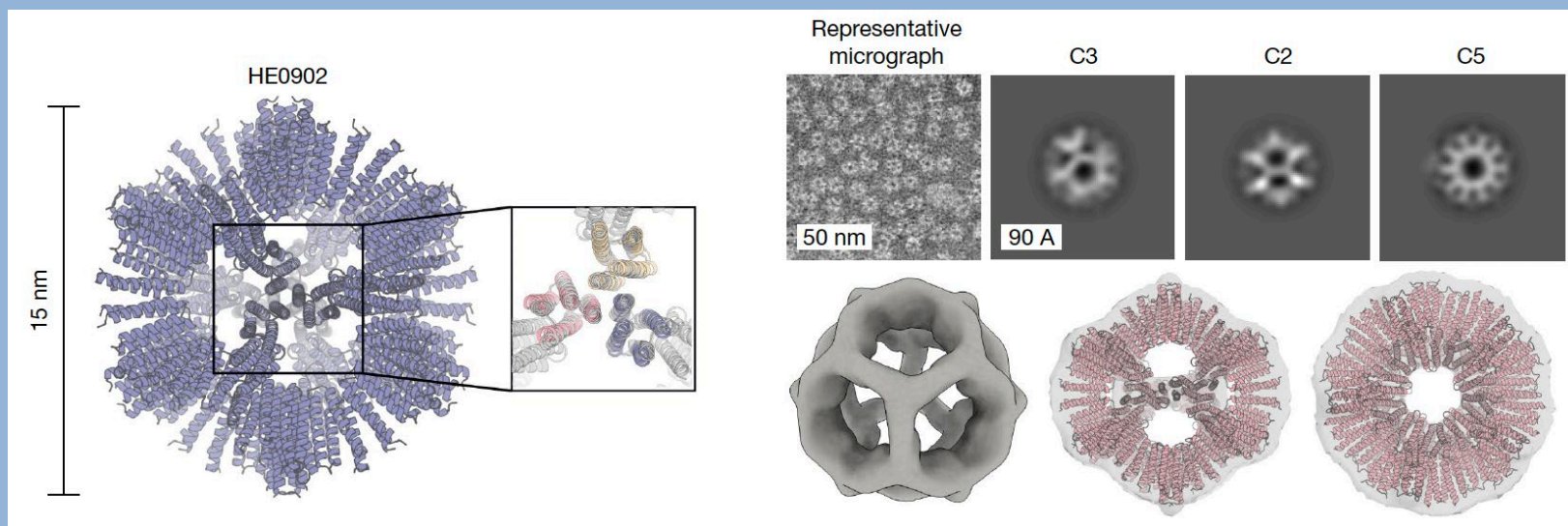
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Open access

 Check for updates

Joseph L. Watson<sup>1,2,15</sup>, David Juergens<sup>1,2,3,15</sup>, Nathaniel R. Bennett<sup>1,2,3,15</sup>, Brian L. Trippe<sup>2,4,5,15</sup>, Jason Yim<sup>2,6,15</sup>, Helen E. Eisenach<sup>1,2,15</sup>, Woody Ahern<sup>1,2,7,15</sup>, Andrew J. Borst<sup>1,2</sup>, Robert J. Ragotte<sup>1,2</sup>, Lukas F. Milles<sup>1,2</sup>, Basile I. M. Wicky<sup>1,2</sup>, Nikita Hanikel<sup>1,2</sup>, Samuel J. Pellock<sup>1,2</sup>, Alexis Courbet<sup>1,2,8</sup>, William Sheffler<sup>1,2</sup>, Jue Wang<sup>1,2</sup>, Preetham Venkatesh<sup>1,2,9</sup>, Isaac Sappington<sup>1,2,9</sup>, Susana Vázquez Torres<sup>1,2,9</sup>, Anna Lauko<sup>1,2,9</sup>, Valentin De Bortoli<sup>8</sup>, Emile Mathieu<sup>10</sup>, Sergey Ovchinnikov<sup>11,12</sup>, Regina Barzilay<sup>6</sup>, Tommi S. Jaakkola<sup>6</sup>, Frank DiMaio<sup>1,2</sup>, Minkyung Baek<sup>13</sup> & David Baker<sup>1,2,14</sup>✉



# Sequence-based drug design as a concept in computational drug design

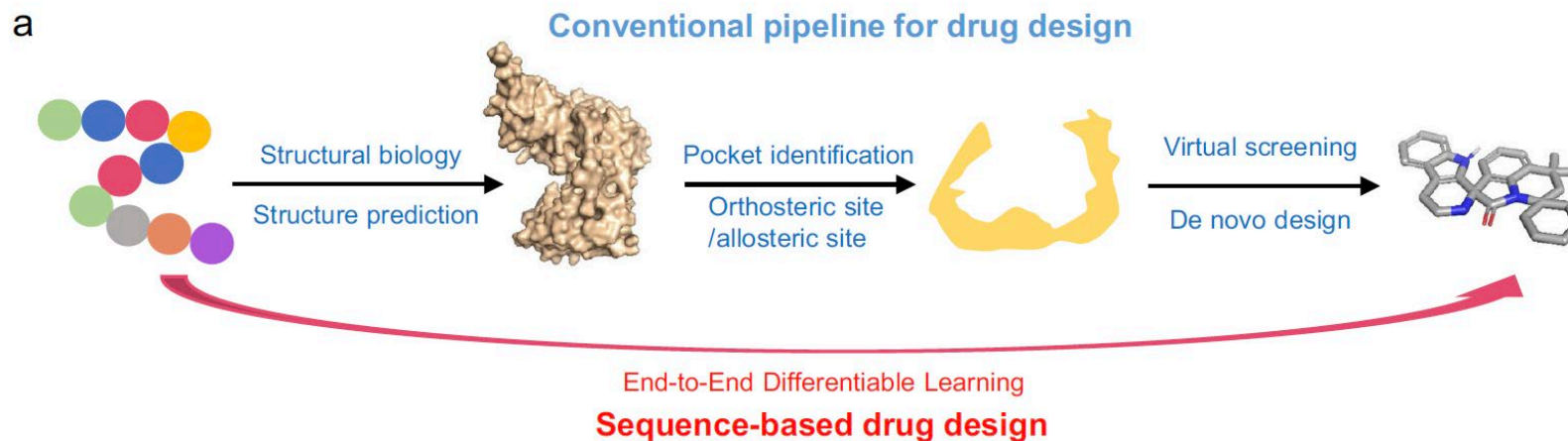
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Check for updates

Lifan Chen <sup>1,2,7</sup>, Zisheng Fan<sup>1,3,4,7</sup>, Jie Chang<sup>1,3,7</sup>, Ruirui Yang<sup>1,2,4,7</sup>, Hui Hou<sup>1,7</sup>, Hao Guo<sup>1</sup>, Yinghui Zhang<sup>1,2</sup>, Tianbiao Yang<sup>1,2</sup>, Chenmao Zhou<sup>1,3</sup>, Qibang Sui<sup>1,2</sup>, Zhengyang Chen<sup>1,2</sup>, Chen Zheng<sup>1</sup>, Xinyue Hao<sup>1,3</sup>, Keke Zhang<sup>1,3</sup>, Rongrong Cui<sup>1</sup>, Zehong Zhang <sup>1,2</sup>, Hudson Ma<sup>1</sup>, Yiluan Ding<sup>5</sup>, Naixia Zhang<sup>5</sup>, Xiaojie Lu <sup>1,2</sup>, Xiaomin Luo <sup>1,2</sup>, Hualiang Jiang <sup>1,2,3,4,6</sup>, Sulin Zhang <sup>1,2</sup> ✉ & Mingyue Zheng <sup>1,2,3,4,6</sup> ✉



# Advanced Biochemistry Course Objectives

- The objective of this course is to study how essential concepts of biochemistry are applied in current biomedical research.
- We will review core topics of biochemistry and read recent research publications related to these topics.

# Course Modules:

1. Amino acids, protein structure
2. Enzymes, biocatalysis
3. Carbohydrates and glycolysis
4. Citric acid cycle
5. Oxidative phosphorylation
6. Glycogen, regulation of metabolism
7. Lipids and lipid metabolism
8. Amino acid metabolism
9. Nucleotide metabolism
10. DNA and RNA
11. DNA replication
12. Transcription
13. Translation I: ribosome assembly
14. Translation II: protein synthesis

# Course Materials

## Textbook

Lehninger's Principles of Biochemistry

Eighth Edition 2021

David L. Nelson & Michael M. Cox, MacMillan



One recent research publication for each class:

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HOME > SCIENCE > VOL. 374, NO. 6575 > AN ORAL SARS-COV-2 M<sup>PRO</sup> INHIBITOR CLINICAL CANDIDATE FOR THE TREATMENT OF COVID-19

| RESEARCH ARTICLE | CORONAVIRUS f t in r w e

## An oral SARS-CoV-2 M<sup>PRO</sup> inhibitor clinical candidate for the treatment of COVID-19

DAFYDD R. OWEN , CHARLOTTE M. N. ALLERTON , ANNALIESA S. ANDERSON, LISA ASCHENBRENNER, [...], AND YUAO ZHU +38 authors [Authors Info & Affiliations](#)

SCIENCE • 2 Nov 2021 • Vol 374, Issue 6575 • pp. 1586-1593 • DOI: [10.1126/science.abc4784](https://doi.org/10.1126/science.abc4784)

183,673 561



# Masters of Arts in Biology

*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 ('**B**' 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.



# Masters of Arts in Biology

## *Tuition Payment Information*

- **Electronic ACH Payment** - Students and their Authorized Users can access the E-Bill & Payment system at <http://payment.brown.edu> to make online ACH payments via a U.S. personal checking or savings account. Electronic ACH payments will post to the student's account immediately and may take up to 48 business hours to post against the payer's bank account.
- **Mail** - Payment by check, money order or certified check must be made payable to Brown University and sent to Brown University Cashier's Office at:
  - Brown University Cashier's Office  
Campus Box 1911  
69 Brown Street, 2nd Floor  
Providence, RI 02912



# Masters of Arts in Biology

## *Pfizer Contact*

- **Kari Donahue**
  - [Katharine.donahue@pfizer.com](mailto:Katharine.donahue@pfizer.com)
  - Pfizer Global R&D; Groton Labs

# **Masters of Arts in Biology**

*Brown Contact*

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  - Isaac\_Bryden@brown.edu

# **Masters of Arts in Biology**

- **Good luck!!**