<center>**BR 1A Winter 2022 (5 units)**
**Biomedical Research: Science in your Time**</center>

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## COVID-19 Instructions

Ensuring a safer campus depends on each of us following the latest UCLA health and safety guidelines. While campus policies must be modified to address changing local, state, and national orders and guidance, the most current information is available at covid-19.ucla.edu.
At present, each of us:

- Is responsible, regardless of vaccination status, for wearing an approved mask that fully covers our nose and mouth for the duration of class, office hours, or other course-related activity.
  - Disposable masks are available at the Wooden Center for anyone unable to obtain a mask or who has forgotten to bring one to campus.
  - Appropriate masks include two-ply woven fabric masks, surgical masks, non-woven KN95 masks, and N95 respirators.
  - Please note that scarves, balaclavas/ski masks, single-layer fabric masks and neck gaiters, bandanas, and turtleneck collars are **not** compliant.
  - For those that have a disability-related reason not to wear a mask, you can contact the Center for Accessible Education (CAE) to obtain an approved accommodation and any appropriate alternative mitigation measures to be sent to instructors.
- Must be fully vaccinated or have submitted an exception request. Per the COVID-19 Response and Recovery Task Force, unvaccinated students with pending or approved exceptions must comply with twice-weekly testing.
- Is required to complete daily symptom checks prior to coming to campus, regardless of vaccination status, and must stay home if you are not cleared by the symptom survey and/or are advised by the Exposure Management Team to quarantine or isolate. Please contact me if you have questions about my policies regarding attendance.

- Attendees will refrain from eating meals in the classroom, except for those with approved accommodations. If you need to eat or drink something for **medical reasons**, please do so quickly and then put on your mask. Otherwise, there will be no eating or drinking in the classroom.

I will do my best to support students who are complying with the requirement to remain away from campus. Contact me if you need to stay home, and we will make alternative arrangements for you to attend class virtually or access class recordings/notes.
Be advised that refusal to comply with current campus directives related to COVID-19 mitigation may result in dismissal from the classroom and referral to the Office of Student Conduct. If you have any questions or concerns about UCLA's COVID-19 protocol, go to https://covid-19.ucla.edu/information-for-students/; if you have any questions specific to this course, I am happy to talk further. Thank you for protecting your fellow Bruins!

**Course Description:**
*Foundations of Science GE requirement*

We are exposed to many interpretations of current science from sources as diverse as The New York Times, Scientific American and Ted talks, to the blogger science enthusiast to reddit. It can be challenging to understand how to weigh the information conveyed to live a healthier life or find the strongest science on disease. In this course we will learn how to identify primary research sources, discussing strengths, deviations and over-interpretation of the primary work in the lay-literature. Using science deconstruction around a biomedical topic, such as metabolic disease or cancer, etc.; the primary literature will become more accessible, enabling you to interpret the data yourself.

The learning outcomes for the Foundations of Science GE requirement are:

1. To understand the role of the scientist in research and the value of research in directing best practices
2. To be able to describe how research in vaccines and exon skipping informs science about the larger human biological system.
3. To be able to critically evaluate primary and secondary sources of scientific information.
4. To be able to identify primary published evidence on a novel hypothesis, assess the data and draw a reasonable conclusion.

*Diversity Requirement*

We will review the process of scientific training from undergraduate to full professor. The course will cover primary research data documenting bias and racism that has traditionally limited diversity at every level of academic research and medicine. Specifically, we will examine white, LatinX, Asian and Black faculty numbers, publication rates and grant funding rates, with an emphasis on disparities around Black representation in STEM. We will interrogate data indicating science practiced in the US public universities focuses on and rewards a certain type of work. Data on discordance between population numbers and representation in STEM fields will be examined. We will discuss the advantages and challenges associated with diversity in STEM. Finally,

we will learn from those who have succeeded, and those still in the process, strategies to support greater diversity in science.  We will discuss ways we can each promote better science through inclusivity.

        The learning outcomes for the Diversity requirement are:

1. To be able to discuss the evidence of inequalities in academia in the STEM fields.
2. To be able to discuss the advantages and challenges associated with diversity in STEM.
3. To be able to review published experimental data on disparities in healthcare and disease research between people of different ethnic origins.

## Foundations of Science GE Credit Acknowledgement

        Upon successful completion of this course, students will meet the GE Foundations of Scientific Inquiry requirement for the life sciences.  Students will critically analyze laymen and primary research literature in order to understand the origins of scientific knowledge.  The course will interrogate the latest experimental techniques, addressing strengths and caveats in resulting data.  Students will acquire skill in identifying appropriately controlled experiments with supported conclusions.  Quizzes will assess basic knowledge, while written problem sets and a final essay including the investigation of a novel hypothesis in the primary literature, will support mastery in analytical skills.  Participation in course discussions will instill confidence in students' competence in scientific communication and their ability to express arguments for or against a scientific conclusion.

## Diversity Requirement Acknowledgement

        Upon successful completion of this course, students will meet the Diversity requirement.  Students will explore the primary and layman literature on diversity in STEM at all levels of engagement, with a focus on the fields of biomedical research and medicine.  Primary literature reporting disproportionate representation of different ethnic groups, with a focus on decreased Black representation compared to white, Asian and LatinX from the undergraduate level through academic faculty and in the practice of medicine.  Quizzes will assess students acquired knowledge the basis for more advanced exploration.  Written responses to case studies and class discussion will enable students to demonstrate a deeper understanding of the barriers to diversity and offer opportunities to propose solutions.

## Class Times and Locations:
Lecture: MWF 10a-10:50
Location: WG Young 4216

Discussion: Friday 11a-11:50a & 12p-12:50p
Location: La Kretz Hall 100

Discussion: Friday 3-3:50p & 4-4:50p
Location: La Kretz Hall 100

**Assessments, Activities and Grades**

       Quizzes will be administered per lecture M/W/F (60 points, 2pts/quiz). The quizzes will be basic questions about the material covered in lecture.  Quizzes are due before the following lecture.  There are four problem sets due as indicated on the syllabus (40 points, 10 points each).  Problem sets will help you assess your understanding of important concepts and material. These will be based on the reading and lecture content.  The answers to the quizzes will be posted soon after they close, so there will not be make up quizzes.  The four problem sets will be exercises in critical analysis, experimental design and understanding how science research is cumulative.  The problem sets will be approximately 1-2 pages in length, most in essay form.

       Discussion review activities will incorporate the weeks lecture material as well as the readings.  They will serve as opportunities to practice discussing topics in science and racial representation in science.  As the course outcomes include the ability to discuss the material, attending discussion is a required activity worth 1 point per week. An additional assignment worth 3 points/week will be required for each meeting as well.

       The final (25 points) will be a topic that asks you to assimilate your knowledge of the quarter's topic and include mechanisms to address inequities in science research as well as academic leadership through the investigation of a novel hypothesis that addresses vaccine research.   The essay will be a 2-pages single spaced paper with additional pages allocated for bibliography and figures.

**Class Points:**

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|---|---|
| Quizzes (30) | 60 |
| Problem sets (4) | 40 |
| Discussion activities (10) | 30 |
| Attendance (1pt per disc) | 10 |
| Final paper | 25 |
| Total | 165 points |

**Community Agreement (Courtesy of Dr. Siobhan Braybrook)**
- To respect each other.
- We are here to get it right, not to be right.
- Make space, take space (or Step Up, Step Back)
- To ask questions, and to find answers together
- Listen with as much care as you would want to be heard-
- Assume good intentions - give each other the benefit of the doubt
- Recognize and expand on other contributions
- Speak from your experiences - intentionally avoid generalizations and speaking for others
- Try and show up as our best selves, and recognize that there is no final 'best'.
- Communicate, if and when we can, about our discomfort- call people in, not out.
- To hold ourselves accountable: when you know better, you do better.
- Oops/Ouch

**Academic Accommodations Based on a Disability.**
Students with disabilities requiring academic accommodations should submit their request for accommodations as soon as possible, as it may take up to two weeks to review the request. For more information, please visit the CAE website (www.cae.ucla.edu), visit the CAE at A255 Murphy Hall, or contact us by phone at (310) 825-1501.

If you are already registered with the Center for Accessible Education (CAE), please request your Letter of Accommodation on the Student Portal. If you are seeking registration with the CAE, please submit your request for accommodations via the CAE website. Please note that the CAE does not send accommodations letters to instructors--you must request that I view the letter in the online Faculty Portal. *Once you have requested your accommodations via the Student Portal, please notify me immediately so I can view your letter.*

| Week | topic | Sci/Div | Reading | Assignment Due |
|------|-------|---------|---------|----------------|
| 1 | Lec1: Syllabus, community agreement | Sci & Div | | Quiz |
| | Lec 2: Exon skipping video, Basic Biology | Sci | https://www.exondys51.com/what-is-exondys51/how-it-works  **Supp:** Crick (1970) | Quiz |
| | Lec 3: Basics of science publications, the scientific method | Sci | Primary vs Secondary Sources Elements of a Research paper  **Supp:** King, et al (2004) | Quiz |
| | | | | |
| | Discussion: Diverse approaches | | Searching for primary sources & Material Review,  Katherine Wu (2020) | |
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| 2 | Lec 4: Who produces scientific data? | Div | **Required READING:**  KW Phillips (2014)  Alsan (2019)  **Supplemental**: Li & Keodel (2017); Funk & Parker (2018); | Quiz |

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|---|---|---|---|---|
| | Lec 5: Where does science come from? The scientific method | Div | **Required READING:** Linda Black Elk (2016), Riegle-Crumb (2019) | Quiz |
| | Lec 6: Where does science come from? Science Training | Div | **Required Reading:** Price (2005) Fisher (2019); Neergard (2011); MacDonald (2021)**,** | Quiz |
| | Discussion: Diversity and Sources | Sci & Div | Working collectively | |
| | | | | |
| 3 | | | **HOLIDAY** | |
| | Lec 7: Where does science come from? Science Training | Div | **Guest Speaker: Inna Keselman, MD/PhD** | Problem Set 1 DUE |
| | Lec 8: Where does science come from? Science Training/Funding | Div | **Recommended READING:** Ginther (2011), Ginther (2018) Grant Funding | Quiz |
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| | Discussion: | Div | Material Review, Health Disparities Diabetes Management | |
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| 4 | Lec 9: Where does science come from? Science Funding | Div | **Required READING:** Lauer (2020), Stevens (2021) Neergard (2011); MacDonald (2021)**,** **Supplementary:** Hoppe (2019), | Quiz |
| | Lec 10: Where does science come from? Primary Research Publications | Div | **Required READING**: Stevens (2021) Publications | Quiz |
| | Lec 11: Exon skipping video, Basic Biology | Sci | https://www.exondys51.com/what-is-exondys51/how-it-works **Required READING**: Kolata (2019) | Quiz |

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| | Discussion: | Div | Material Review, Resolving Award Disparities (maternal mortality) | |
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| 5 | Lec 12: Where does science come from? | Div | **A Conversation with Dr. D'Juan Farmer, PhD** | Quiz |
| | Lec 13: Deconstruction | Sci | **Required READING**: Koenig (1987), Bulfield (1984), | Quiz |
| | Lec 14: Deconstruction | Sci | **Required READING**: Sicinski (1989), Dunckley (1998) | Problem Set 2 DUE |
| | | | | |
| | Discussion: Resolving Racial disparities – your solutions | Div | What can you do? Discussion/brainstorming & Material review | |
| | | | | |
| 6 | Lec 15: Deconstruction | Sci | **Required READING**: Gebski (2003); Mendell (2013) | Quiz |
| | Lec 16: Deconstruction, | Div | **Required READING**: Villalta (2014) | Quiz |
| | Lec 17: Deconstruction, diverse perspectives | Div | **A conversation with Dr. S. Armando Villalta** | Quiz |
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| | Discussion: | Sci | Material Review, How would YOU design a vaccine clinical trial? | |
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| 7 | Lec 18: Deconstruction, | Div | Shi????? | Quiz |
| | Lec 19: Vaccine | Sci | https://thenewamerican.com/bio-warfare-weaponization-of-medicine-amid-covid/<br><br>Real Time with Bill Maher Season 19 E3 | Quiz |
| | Lec 20: | Sci | The Immune System | Quiz |
| | Discussion: | Sci | Material Review, How would YOU design a vaccine clinical trial? | |
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| 8 | | | **HOLIDAY** | |

| | Lec 21: Deconstruction | Sci | **Required READING**: Takahashi (1974); <br> **Recommended Reading:** Huzair (2017) | Problem Set 3 DUE |
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| | Lec 22: Deconstruction | Sci | **Required READING:** https://www.the-scientist.com/news-opinion/vector-based-vaccines-come-to-the-fore-in-the-covid-19-pandemic-67915 <br><br> Astrazenca, J&J, Russian vaccine? Chinese developed vaccine? <br> **Recommended Reading:** Corum J&J; (2020) Astrazeneca (NY Times) | |
| | Discussion: | Sci | Material Review: vector vaccines vs attenuated virus vaccines | |
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| 9 | Lec 23: JNJ & AstraZeneca | Sci | **Required READING**: Corum (2020) BioNTech (Pfizer), Polack (2020), <br><br> **Recommended reading:** Lee (2021), CDC Side Effects Report | Quiz |
| | Lec 24: Hydroxy-chloroquine & Ivermectin | Sci | **Required READING**: Maisonnasse (2020 <br><br> **Recommended reading:** Boulware (2020);  Chaccour, (2021) | Problem set 4 Due |
| | Lec 25: Vitamin D | Sci | **Required READING**: & Entrenas-Castillo (2020) <br><br> **Supp:** Shieh (2018), NICE Methods (Entrenas-Castillo), Murai (2021) | Quiz |
| | Discussion: TBD | | Material Review: Astrazenca/J&J vs  Pfizer/Moderna  (vector vs lipid nanoparticle[RNA]) – if we can't get Mason | |
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| 10 | Lec 26: | Div | **A conversation with Dr. Jaunian Chen, PhD** | Quiz |

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| | Lec 27: | Div | **Required READING**: Corbett (2020) *mouse | Quiz |
| | Lec 28: Vaccine, Diversity | Div | **Recommended Reading** Corbett (2020) *primates | Quiz |
| | Discussion: TBD | | Material Review: | |

**Reading List (Example)**

Wu, Katherine. (2020) Scientific Journals Commit to Diversity but Lack the Data. *The New York Times* (https://www.nytimes.com/2020/10/30/science/diversity-science-journals.html )

Phillips, KW (2014) "How diversity makes us smarter" *Scientific American* (https://greatergood.berkeley.edu/article/item/how_diversity_makes_us_smarter )

Li & Koedel (2017) Representation and Salary Gaps by Race/Ethnicity and Gender at Selective Public Universities. *Educational Researcher*

Funk & Parker (2018) Diversity in the STEM workforce varies widely across jobs (https://www.pewsocialtrends.org/2018/01/09/diversity-in-the-stem-workforce-varies-widely-across-jobs/)

Black Elk, L.(2016) "Native Science: Understanding and Respecting Other Ways of Thinking" *Society for Range Management*

Alsan, et al, (2019) Does Diversity Matter for Health? Experimental Evidence from Oakland. *American Economic Review*

Greenwood, et al (2020) Physician-patient racial concordance and disparities in birthing mortality for newborns. *PNAS*

Riegle-Crumb, C, et al (2019) Does STEM Stand Out? Examining Racial/Ethnic Gaps in Persistence Across Post-secondary Fields. *Educational Research*

Price, EG. (2005) "Cultural Diversity in Academic Medicine" *Journal of General Internal Medicine*

Fisher, AJ, et al (2019) Structure and belonging: Pathways to success for underrepresented minority and women PhD students in STEM fields. *PLOS ONE*

Neergaard, L (2011) Black Scientists lag whites in government funding. *Washington Times (https://www.washingtontimes.com/news/2011/aug/18/black-scientists-lag-whites-in-government-funding/ )*

MacDonald, H (2021) The NIH's Diversity Obsession Subverts Science. *Wall Street Journal: Opinion* ([https://www.wsj.com/articles/the-nihs-diversity-obsession-subverts-science-11625090811](https://www.wsj.com/articles/the-nihs-diversity-obsession-subverts-science-11625090811) )

Ginther, DK, et al (2011) Race, Ethnicity, and NIH Research Awards. *Science*

Ginther, DK, et al (2018) Publications as predictors of racial and ethnic differences in NIH research awards. *PLOS ONE*

Hoppe, TA, et al (2019) Topic choice contributes to the lower rate of NIH awards to African-American/black scientists. *Science Advances*

Lauer, M (2020) Open Mike: Institute and Center Award Rates and Funding Disparities. [https://nexus.od.nih.gov/all/2020/08/12/institute-and-center-award-rates-and-funding-disparities/](https://nexus.od.nih.gov/all/2020/08/12/institute-and-center-award-rates-and-funding-disparities/)

Stevens, KR, et al (2021) Fund Black scientists.  *Cell*

Kolata, G (2019).  For Many Boys With Duchenne Muscular Dystrophy, Bright Hope Lies Just Beyond Reach.  *New York Times.*

Koenig, M, et al (1987) Complete Cloning of the Duchenne Muscular Dystrophy (DMD) cDNA and Preliminary Genomic Organization of the DMD Gene in Normal and Affected Individuals. *Cell*

Bulfield., G, et al (1984). X-linked muscular dystrophy (mdx) in the mouse.  *PNAS*

Sicinski, et al  (1989) The molecular basis of muscular dystrophy in the mdx mouse: A Point Mutation. *Science*

Dunckley , et al (1995). Modification of splicing in the dystrophin gene in cultured Mdx muscle cells by antisense oligoriboonucleotides.  *Human Molecular Genetics.*

Gebski, BL, et al (2003) Morpholino antisense oligonucleotide induced dystrophin exon 23 skipping in mdx mouse muscle. *Human Molecular Genetics*.

Mendell, et al (2013) Eteplirsen for the Treatment of Duchenne Muscular Dystrophy. *Ann Neurology*

Shi, et al (2013) Improved regenerative myogenesis and muscular dystrophy in mice lacking Mkp5.  *JCI*

Villalta, SA, et al (2014)  Regulatory T cells suppress muscle inflammation and injury in muscular dystrophy. *Science Translational Medicine.*

Takahashi, et al (1974) LIVE VACCINE USED TO PREVENT THE SPREAD OF VARICELL IN CHILDREN IN HOSPITAL. *THE LANCET*

Corum (2020) How the BioNTech vaccine works. *New York Times*

Polack, et al (2020) Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. *NEJM*

Lee, et al (2021) Thrombocytopenia following Pfizer and Moderna SARS-CoV-2 vaccination. *American Journal of Hematology*

CDC Covid-19 Vaccine Side Effects Report
https://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2021-01/06-COVID-Shimabukuro.pdf

Corum (2020) How the Oxford-Astrazenca vaccine works. *New York Times*

King, A (2020) Vector-Based Vaccines Come to the Fore in the COVID-19 Pandemic. *The Scientist*

Maisonnasse, P, et al (2020) Hydroxychloroquine use against SARS-CoV-2 infection in non-human primates. *Nature*

Chaccour, C, et al (2021) The effect of early treatment with ivermectin on viral load, symptoms and humoral response in patients with non-severe covid-19: a pilot, double-blind, placebo-controlled, randomized clinical trial. *E Clinical Medicine*

Bouleware, DR, et al (2020) A Randomized Trial of Hydroxychloroquine as Postexposure Prophylaxis for Covid-19. *NEJM*

Entrenas-Castillo, et al; (2020) Effect of calcifediol treatment and best available therapy versus best available therapy on intensive care unit admission and mortality among patients hospitalized for COVID-19: A pilot randomized clinical study. *J of Ster Biochem & Molec Biol*

Murai, et al (2020). Effect of a Single High Dose of Vitamin $D_3$ on Hospital Length of Stay in Patients with Moderate to Severe COVID-19: A Randomized Clinical Trial. *JAMA*

NICE Report UK:  Vitamin D for COVID-19.
https://www.nice.org.uk/guidance/ng187/evidence/evidence-reviews-for-the-use-of-vitamin-d-supplementation-as-prevention-and-treatment-of-covid19-pdf-8957587789

Shieh, et al (2018) Associations Between Change in Total and Free 25-Hydroxyvitamin D with 24,25-Dihydroxyvitamin D and Parathyroid Hormone. *J Clinical Endo & Metab*

Ma & Li (2016) Dr. Wu Lien-The, plague fighter and father of the Chinese public health system. *Protein Cell*

Flohr, C (1996) The Plague Fighter: Wu Lien-the and the beginning of the Chinese public health system.  *Annals of Science*

Corbett, et al (2020) SARS-CoV-2 mRNA vaccine design enabled by prototype pathogen preparedness. *Nature*

Corbett, et al (2020).  Evaluation of the mRNA-1273 Vaccine against SARS-CoV-2 in Nonhuman Primates. *NEJM*