

The Science of COVID-19

BIO 108

BLOCK 8, 2019/20

April 20 to May 13, 2020

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Office: Russell Science Center, room 205 (Please don't come by; you're not supposed to be on campus.)

Office hours: I am available M-F after the Zoom presentation at 12. Please email me when you want to talk and I will send a Zoom invite.

Teaching Assistants:

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Preface:

I am going to begin this syllabus by using the words of Associate Professor, Brandon Bayne, in the Department of Religious Studies, UNC, Chapel Hill.¹

Principles

1. *Nobody signed up for this.*
 - *Not for the sickness, not for the social distancing, not for the sudden end of our collective lives together on campus*
 - *Not for an online class, not for teaching remotely, not for learning from home, not for mastering new technologies, not for varied access to learning materials*
2. *The humane option is the best option.*
 - *We are going to prioritize supporting each other as humans*
 - *We are going to prioritize simple solutions that make sense for the most*
 - *We are going to prioritize sharing resources and communicating clearly*
3. *We cannot just do the same thing online.*
 - *Some assignments are no longer possible*
 - *Some expectations are no longer reasonable*
 - *Some objectives are no longer valuable*

¹ https://docs.google.com/document/d/1-6d_W8rdzE9mW2DvPi-dPvRxo4sekKlz3VqEpnu4Dwg/preview

4. *We will foster intellectual nourishment, social connection, and personal accommodation.*
 - *Accessible asynchronous content for diverse access, time zones, and contexts*
 - *Optional synchronous discussion to learn together and combat isolation*
5. *We will remain flexible and adjust to the situation.*
 - *Nobody knows where this is going and what we'll need to adapt*
 - *Everybody needs support and understanding in this unprecedented moment*

I wish I had written these principles which are precisely what we are all experiencing right now and how we should think about this course and our collective experience. Hopefully, these will help us to cope and even learn to learn in new and exciting ways.

Why this course, this topic?

This might seem like a no-brainer right now. We are being overwhelmed by information, both supported and unsupported, both fact and fiction, both optimistic and alarmist. We might want to stay in our homes and lock out not only this virus but also the news. I just “Googled” COVID-19 and got 8,220,000,000 results in 0.70 seconds. By the time you read this, that number will surely triple. (I don’t suggest doing this!) We would prefer to binge watch that series that everyone is discussing, or paint that wall that has needed a new coat for a few years, or walk the dog. But maybe what we should do is get to know this “enemy”. What is it? Why can it kill? How did it get here? How can we stop it? Idioms and phrases that are appropriate here are, “If you know both yourself and your enemy, you can win a hundred battles without jeopardy”.² Or, “Knowledge is power”.³ Or, as paraphrased from Thomas Jefferson, knowledge is power, knowledge is safety, and knowledge is happiness.⁴

This course is about the science of Corona Virus Disease- 19, or COVID-19. Although we may mention the political, economic, and social aspects of this disease, we will not focus on these, but we cannot ignore them either. The course is broken down into four “blocks of information” which correspond, not surprisingly, to the weeks of the block:

1. Infectious Diseases, Pandemics, and Viruses
2. Viral Infections, Host Responses, and the Immune System
3. Diagnostics, Testing, Treatment
4. Where do we go from here, and what lessons have we learned?

I have sorted, and am continuing to sort, through volumes of materials including websites, articles, and videos that will help us to understand the topics in each of these “blocks”. (See Schedule on Moodle) You may also encounter materials that you would like to share with the rest of the class. (Remember Principle number 2!) You will examine some of this material on your own and report back to the class. We will engage, as well as possible, in online discussions of this material. (Principle number 4!) And,

² https://en.wikipedia.org/wiki/The_Art_of_War#Quotations

³ https://en.wikipedia.org/wiki/Scientia_potentia_est

⁴ <https://www.monticello.org/site/research-and-collections/knowledge-power-quotations>

yes, we will remain flexible (Principle number 5!) and adapt to circumstances beyond our control. If a conversation takes us away from our “blocks”, then we should see where that conversation takes us. Above all, remember Principle 1; we did not sign up for this, but, we will make the most of it.

Course Goals

We will try to answer these questions. Many of these questions overlap, and we will encounter them in other “blocks”. Please realize and understand that this pandemic is a moving target and things, including the science underlying the pandemic, is changing at a phenomenal rate. Therefore, do not be surprised if some of these topics change. The schedule will be available at the latest on Sundays for each week.

1. Infectious Diseases, Pandemics, and Viruses
 - a. What is the difference between an epidemic and a pandemic?
 - b. What constitutes an infectious disease?
 - c. What is epidemiology, and how can epidemiology help us explain the spread of an infectious disease? What is R_0 ; what is a “super-spreader event”; who is a “super-spreader”?
 - d. What have we learned from other pandemics of the 20th and 21st century? What have we forgotten?
 - e. What is a virus? How are viruses different from other infectious organisms? What are the components of viruses? How are viruses different from each other?
 - f. What is a viral infection? What are the different types of viral infections?
 - g. How does a virus infect a host? What is a host receptor, and what is the viral ligand for that receptor?
 - h. What are zoonotic viral diseases? What is “Spillover” and how often and when has this happened? How can viruses jump species barriers and cause diseases in humans?
 - i. What is a coronavirus? What is SARS-CoV-19, and how is this virus different from other coronaviruses that cause disease in humans?
2. Viral Infections, Host Responses, and the Immune System
 - a. How does a virus infect a host? What is a host receptor, and what is the viral ligand for that receptor?
 - b. What are the symptoms of COVID-19? What causes these symptoms?
 - c. What is the host response to a viral infection and what are the consequences of viral replication in a host cell and tissue?
 - d. What is the innate immune response to a virus? What is the adaptive immune response? What are antigens; what are antibodies? What is a “cytokine storm”?
 - e. What is pneumoniae? What causes pneumoniae? What is the most common cause of disability and death due to COVID-19?
 - f. What other organs, besides the lungs, could be involved in viral infections?
3. Diagnostics, Testing, Treatment
 - a. What is the epidemiology of COVID-19? Why did the virus that causes COVID-19 quickly become a pandemic?

- b. What is the science behind “social distancing”? What is the evidence that isolation and social distancing work against transmitting the virus?
 - c. How can an infection with SARS-CoV-2 be detected? What is the principle behind testing? What is PCR? Why is testing for the virus lacking behind in some countries but not in others?
 - d. Is everyone who tests positive for SARS-CoV-2 going to become sick? What determines the susceptibility to the virus? What are “co-morbidities”? Why do older individuals become more sick than younger individuals? Why are children, on average, not becoming as sick?
 - e. How is COVID-19 affecting healthcare within the world and within the United States?
 - f. What drugs could be used to treat COVID-19? What viral components would be targets of potential drugs?
 - g. How could a vaccine be developed against the SARS-CoV-2? What is the vaccines’ target? How effective would this be? What parallels are there between the flu vaccine and a COVID-19 vaccine? How long does vaccine development take?
4. Where do we go from here, and what lessons have we learned? There are no specific questions or goals here. We will see where this pandemic leads us, and our knowledge will bring us power, safety, and happiness.

Course Support of Educational Priorities and Outcomes of the College

Knowledge: You will gain knowledge of the various aspects of COVID-19 including epidemiology and other parameters of global health, the distinctiveness of the virus that causes COVID-19, the response of the immune system to the virus, the physiological and pathological response to the virus, diagnosis and treatment.

Inquiry: You will find and critique materials related to COVID-19.

Reasoning and Communication. You will write several papers that investigate and analyze aspects of the COVID-19 pandemic.

Required Texts, Materials, or Equipment

All materials are available on the Moodle course folder. Please be sure you can access the folder and can upload documents to the site.

Websites are linked from the course schedule.

Grading and Assignments

Creating a grading policy that accurately reflects what you have learned in this course is difficult but this is my sincere attempt to be fair and equitable. I will assess your performance in this course on basically two things: participation and writing.

Participation: 30% of your final grade.

Active engagement and participation with this course are essential to your learning. I expect you to participate as fully as possible each day of the block (see synchronous and asynchronous teaching). Your assigned Teaching Assistant (TA) and I will monitor when, and if, you access Moodle to check on materials and to upload your assignments. If you have difficulties accessing or uploading documents, contact one of us immediately.

You can demonstrate active engagement by submitting questions to either your TA or to me on any of the materials such as websites, articles, or PowerPoint presentations. Please make your questions specific to the material. However, you may also want to ask questions regarding a news article you read or something you heard that pertains to COVID-19. We will begin each daily session with your questions.

Participation also means keeping to a schedule and submitting requested questions, assignments and thesis paper on time. Demonstrating that you have reviewed these websites and presentations by asking thoughtful questions is sufficient for participation. **You are required to post at least one question a day to Moodle Forum on either a presentation, a website you were asked to view, or something that you heard that day.** Failure to submit questions every day of the block will result in a 5% decrement to your participation grade for each failure. Participation also means that your assignments are submitted on time. Late assignments will affect not only your grade for the assignment but also your grade for participation. Your participation grade will be docked 10% if you fail to turn in an assignment on time.

Assignments and Papers: 70% of your final grade. Instructions are found on Moodle under the assignment name.

Assignments are more formal and will receive a letter grade (see Rubric for Assignments). Assignments that are late, 9:05AM is considered late, will not be graded and will receive an F. If you find yourself falling behind, contact your TA or me immediately and not 5 minutes before the assignment is due but at least 12 hours before the assignment is due, and we will try to assist. Your thesis paper is a structured assignment including an outline, and two drafts each with their own due date. Since the thesis is a team project, due dates are final and cannot be altered. See instructions for the thesis paper for further information.

Week	Assignment name	% of total grade	Due (upload to Moodle on date indicated)
1	1A, Personal History	2	Tuesday, April 21, 9AM
	1B, Navigating the Uncharted	5	Tuesday, April 21, 9AM
	1C, Current Questions	8	Friday, April 24, 9AM
2	1D, Gregg and the Pandemic of COVID-19	10	Tuesday, April 29, 9AM

Week	Assignment name	% of total grade	Due (upload to Moodle on date indicated)
	2A, Gregg and the Pandemic of COVID-19	10	Friday, May 1, 9AM
3	Draft first two pages of Research-Based Essay	5	Monday, May 4, 9AM
	3A, Gregg and the Pandemic of COVID-19	10	Wednesday, May 6, 9AM
	Draft of complete Research-Based Essay	5	Friday, May 8, 9AM
4	Final Research-Based Essay	15	Wednesday, May 13, 9AM

Role of Professor:

This is a new format for me, as it probably is for a lot of you. I will make mistakes but will try to do my best to make this block educational and interesting. I am sure we will have technological and internet glitches but we will work through this together. I am available from 8AM-5PM, 7 days a week but may not answer your emails that quickly on the weekend. I am not available 24 hours a day! Do not expect an email from me between 9PM and 8AM. The best way to reach me is via email but if you would like a face-to-face, I can schedule a Zoom meeting with you. If you have an emergency, contact me via my cell phone: 319-573-5728. Please reserve calling me directly only for emergencies.

I will be teaching from my home which I share with one human and three magnificent Siberian Huskies, who seem to feel that they deserve their walk several times a day since I am home. I will try to limit distractions just like I expect you to limit distractions.

Role of Teaching Assistants (TA):

We have the assistance of three upper level students who are majoring in biochemistry and molecular biology to help us this block. The class will be divided into 3 groups of 8-9 students each, and one TA will be assigned per group. The TA is responsible for keeping track of students in their group, for assisting with written assignments, and for answering any questions. Groups will meet with their TA outside of scheduled meetings with me. Groups can do this via "chat rooms", via Moodle, or any other way the group finds convenient. You all probably know more about how to structure this than I do. Consider your TA as your mentor. I will be in constant contact with each TA but please feel free to contact me directly also. Both your TA and I will be reading your materials and discussing your progress. Grades will be assigned only by me.

One of our TA's is also a consultant for the Writing Studio and is being paid by the Studio just for our course. Send drafts of your papers to Olivia Knowles. The other TA's are also available to review papers.

Our TA's and their contact information:

Olivia Knowles: oknowles20@cornellcollege.edu

Skye McCormick: smccormick22@cornellcollege.edu

MaryJo Schmidt: mschmidt20@cornellcollege.edu

Synchronous vs Asynchronous teaching:

We are all in different time zones, even some students in different countries; we have different commitments to our days. There is no way we can all be online at the same time. Synchronous, face-to-face, teaching allows us more personalization and affords us an opportunity to talk openly to each other, answer questions immediately, and discuss in real time. I am used to using slides and a whiteboard to illustrate concepts. I am used to answering student's questions immediately. But the best we can do right now is to record sessions for viewing and reviewing when we are available. We need to be patient with all this. If you have the capacity, I would like you to join me live on Zoom. However, if this is not possible, please watch the recorded sessions and send me questions. Your TA's will be part of the live Zoom sessions and can answer questions also. However, doing a Zoom session all alone can feel rather futile. Please join me when you can.

Zoom presentations will be 10-12AM, Central Time Zone, Monday-Friday.

Please review this document from the Center for Teaching and Learning.

<https://docs.google.com/document/d/1iBZUE2OfkfMdjL6HueUhlYFnudyIC8IGzdRI5mNkRI/edit>

DISABILITIES AND ACCOMMODATIONS POLICY:

Cornell College makes reasonable accommodations for persons with disabilities. Students should notify the Office of Academic Support and Advising and their course instructor of any disability related accommodations within the first three days of the term for which the accommodations are required, due to the fast pace of the block format. For more information on the documentation required to establish the need for accommodations and the process of requesting the accommodations, see <http://www.cornellcollege.edu/academic-support-and-advising/disabilities/index.shtml>.

ACADEMIC HONESTY POLICY:

Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgment of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Catalogue, under the heading "Academic Honesty."