WHY ???

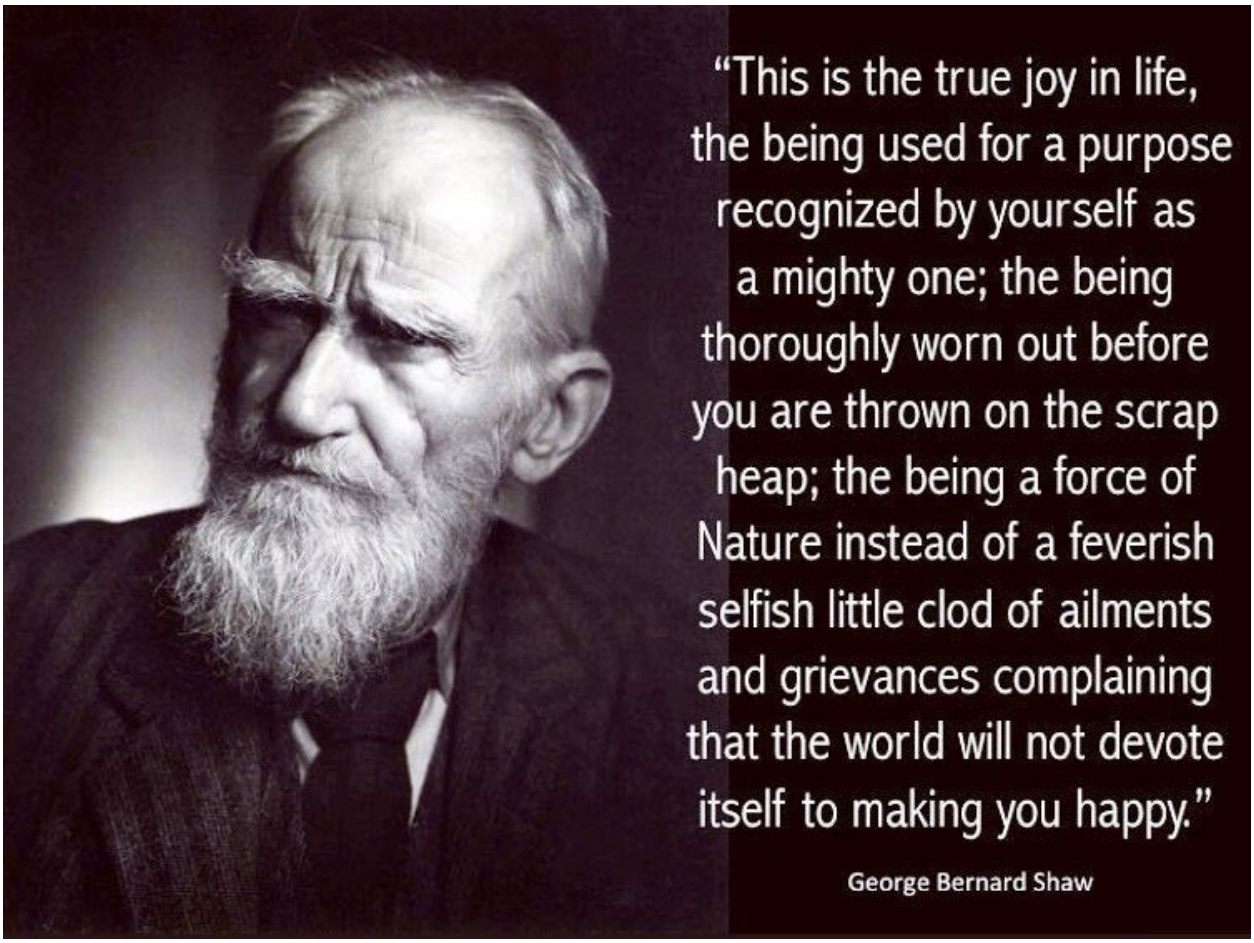
Rationale

For the next few decades one of the most important pursuit for humanity may be the attempt to prevent another pandemic. If prevention fails, and it most likely will, the preparation to mitigate the mortality and morbidity must become priority one.

The imperative for imagination and invention must be viewed as a clarion call for every academic who may be in a position to contribute, however little that contribution may be. The fruits of this global effort will not be limited to the Ivory Towers in US. Breakthroughs may germinate in any institution, in any town and anywhere in the world.

One of the pillars of preparation is training in molecular virology, especially the frontier of knowledge necessary to understand the risk from viruses with pandemic potential. There are at least 25 potential viruses which are identified threats and hundreds or thousands pose risks which are still largely unknown.

I am an ordinary individual with limited scientific background but capable of sharing some knowledge about virology. This is why, as an academic, I am trying to contribute to the global preparation by enabling university students to learn and appreciate the basic science and biomedical context of molecular virology.


"This is the true joy in life, the being used for a purpose recognized by yourself as a mighty one; the being thoroughly worn out before you are thrown on the scrap heap; the being a force of Nature instead of a feverish selfish little clod of ailments and grievances complaining that the world will not devote itself to making you happy."
George Bernard Shaw

Traditional course ?

Introduction to **Molecular Virology**: Classical, Comparative & Curated Topics for Brief Discussions

Discussion sessions meet twice a week for 90+ minutes per session. Pre-reading lists are "home-work". The topics included below may be extended for a 2 year (4 semester) course in Virology. Extending virology for healthcare and public health can add another 2 years for students in school of medicine.

WK 1-2	**History & Viruses:** '*The farther back you can look, the farther forward you are likely to see.*'
	Why Study Viruses: Pandemics, epidemics - Proximate threats to crop, animals & humans?
	Viruses for Good: Are viral vectors used only for human gene therapy? What is the future?

WK 3-4	**Classification:** Taxonomy, phylogenetics and the Baltimore System
	The Outside: Structure of viral capsids, envelopes and assembly mechanisms
	The Inside: Organization of the genome (DNA and RNA viruses)

WK 5-6	**Case Study: Ebola**

WK 7-8	**Defense and Immunity:** Anti-viral mechanisms and ligand decoys
	Defense and Immunity: Immune evasion mechanisms
	Defense and Immunity: Vaccines, Antigenic Drift & Molecular Evolution
	Defense and Immunity: The eradication of Polio – fact or fiction?

WK 9-10	**(+) ss RNA viruses:** Picornaviridae, Coronaviridae, Flaviviridae, Calciviridae

WK 10-11	**Case Study:** SARS-CoV

WK 11-12	**Case Study:** Influenza 1918-2018

WK 12-14	**Global Health and Epidemiology:** Varicella-zoster, Variola, HPV, HSV and HIV

WK 14-16	**Plant Viruses:** Food and friend or foe - human and animal healthcare from plant biologics?

Grades: Two papers per semester constitutes the number/letter grade for the course (per semester). Each student will select a topic/paper (list will be provided) for each of her/his term paper. Other options will be made available. Students are urged/encouraged to think *creatively, outside-the-box.*

ESSENTIAL COURSE -

Molecular Virology: Curated Topics for Essential Post-Pandemic Courses in Biology and Medicine

Discussion sessions meet twice a week for 90+ minutes each time. Pre-reading lists are "home-work". The topics included below may be extended for a 2 year (4 semester) course in Molecular Virology. Brainstorming entrepreneurial innovation in healthcare and public health can add another 4 semesters. The topics/subtopics in the table are subject to changes, reorganization and resequencing, anytime. The MIT Library page "Molecular Virology" contains reviews https://dspace.mit.edu/handle/1721.1/128017

WK 0	Monumental Milestone in Virology: Renato Dulbecco and "Induction of Cancer by Viruses"
WK 1	Molecular Epidemiology: The Pandemic in Progress
WK 2	Etiology of CoVID-19: Characteristics of subgenus Sarbecovirus of genus Betacoronaviridae
WK 3	Molecular Phylogenetics: Coronaviridae
WK 4	Molecular Structure: SARS-CoV-2: viral capsid and envelope proteins
WK 5	Molecular Mechanism of Viral Entry: Spike Protein Structure, Genomics of ACE2 conservation
WK 6	Genome Organization: SARS-CoV-2 +ssRNA and the Baltimore System of Classification
WK 7	In Common: Replication of Genetic Material in Cancer Chemotherapy, HIV-AIDS and CoVID-19
WK 8	Preventing Viral Entry: More than Half a Century in the making of the mRNA Vaccine
WK 9	Immunity: Complicated Response, Epitope Selectivity and Immuno-compromised Individuals
WK 10	Genome Size of the Coronaviridae family: Molecular evolution of variants (antigenic drift)
WK 11	Molecular evolution of variants: Antigenic drift and epitope dynamics in vaccine efficacy
WK 12	Molecular Diagnostics: Infection spreads while experts debate about Sensitivity vs Frequency
WK 13	Global Public Health: Medical Tools and Devices for the Wealthy vs the Rest of the World
WK 14	Molecular Therapeutics: Are there alternatives to vaccines?
WK 15	Molecular Virology: Mortality & Morbidity from the Next 25 Viruses with Pandemic Potential
WK 16	Molecular Medicine: Beyond the Horizon – Humanity Needs Dreamers

Grades: Two papers per semester constitutes the number/letter grade for the course (per semester). Each student will select a topic/paper (list will be provided) for each of her/his term paper. Other options will be made available. Students are urged/encouraged to think *creatively, outside-the-box.*

science.org/content/article/sars-viruses-may-jump-animals-people-hundreds-thousands-times-year

Emerging viral diseases from a vaccinology perspective: preparing for the next pandemic

*Barney S. Graham * and Nancy J. Sullivan**

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SCIENCEINSIDER

SARS-like viruses may jump from animals to people hundreds of thousands of times a year

Study pinpoints Asian regions that could spark the next coronavirus pandemic

15 SEP 2021 • 5:35 PM • BY KAI KUPFERSCHMIDT

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7097586/pdf/41590_2017_Article_7.pdf