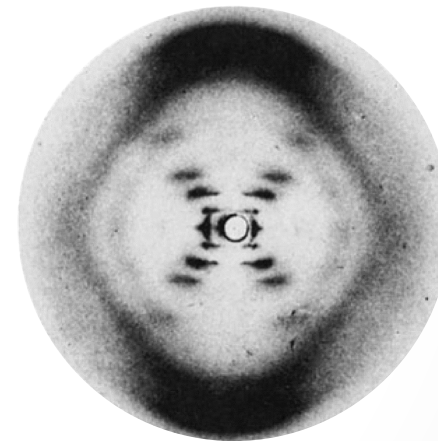
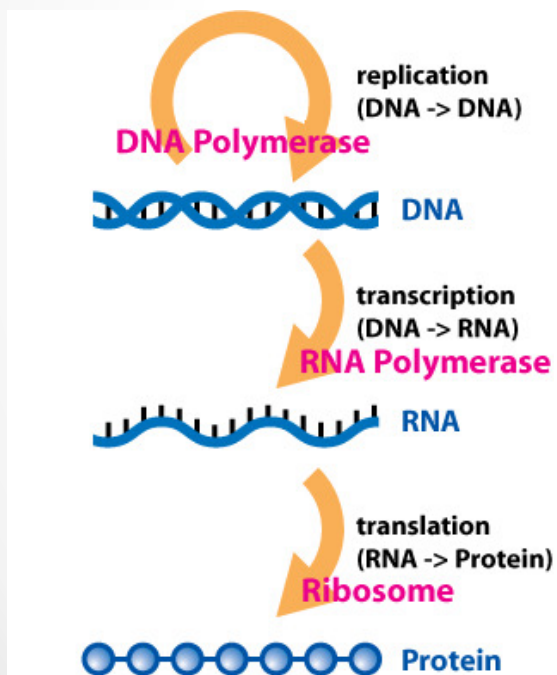


An Introduction to the Introduction of Modern Life Sciences

Yang Yang (杨扬)

The Purpose of this Course

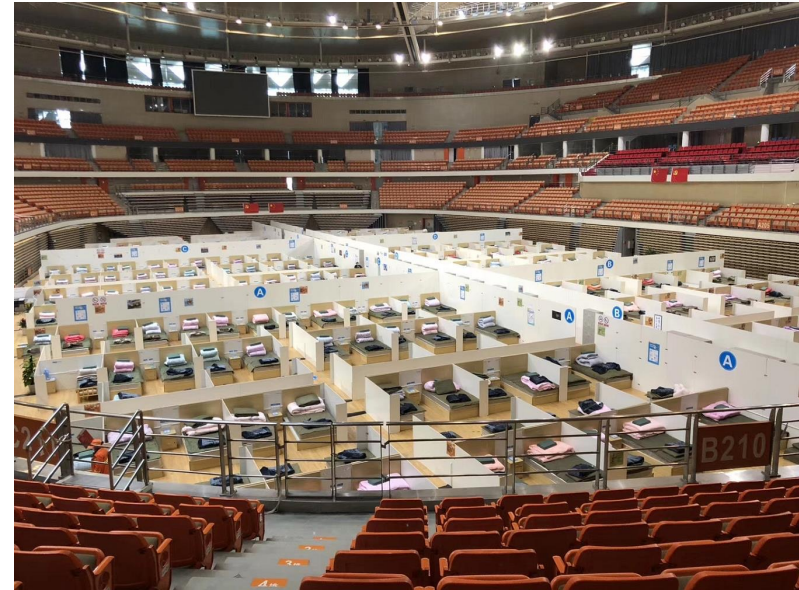
- **Biology is an essential part of an educated person's knowledge base**
 - Principles, logics, and rules that apply to ALL living organisms on this planet



The key X-ray photograph involved in the elucidation of the DNA structure.
by Rosalind Franklin

The Purpose of this Course

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 - Principles, logics, and rules that apply to ALL living organisms on this planet
 - Public health: epidemic and pandemic

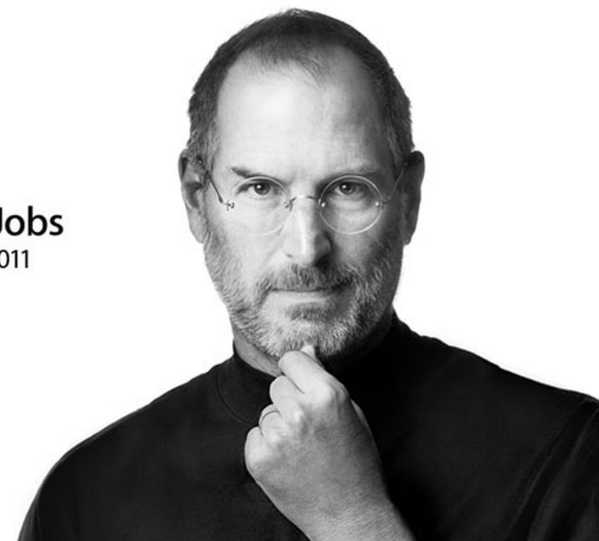


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 - Public health: epidemic and pandemic
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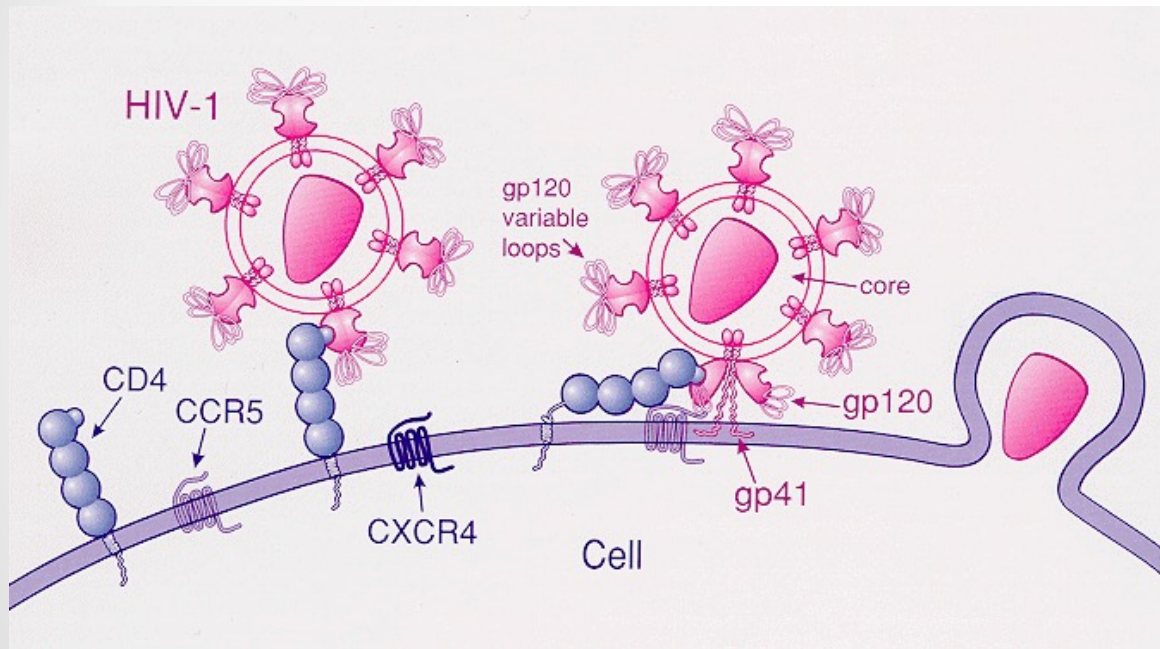
Steve Jobs
1955-2011



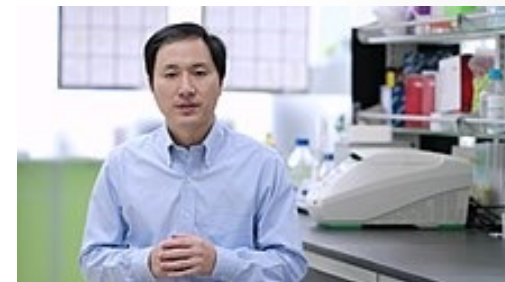
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 - Ethics: human genome editing

Ethical Red Line

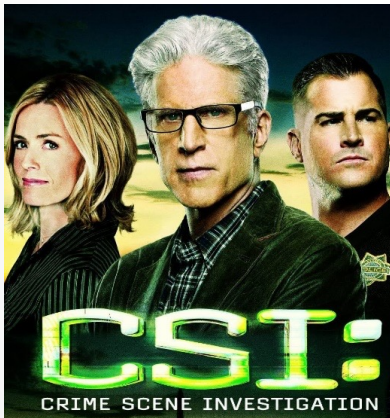


- Edit CCR5 gene in human embryos **without** ethics approval
- Two babies were born in 2018
- He Jiankui was sentenced to **3 years in prison** 2019 (released in 2022)



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 - Personal health: in daily life and in case of illness
 - Ethics: human genome editing
 - Other applications: crime investigation, paternity test



高承勇，1964年生，甘肃人。
1988年5月至2002年2月，高承勇在甘肃白银、内蒙古包头强奸杀人作案11起，杀害11人。
2018年3月30日，白银市中院一审宣判被告人高承勇死刑。2019年1月3日，高承勇被执行死刑。

The Purpose of this Course

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 - Public health: epidemic and pandemic
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 - Ethics: human genome editing
 - Other applications: crime investigation, paternity test
- **Challenging but especially important to those who didn't take biology/chemistry in high school**

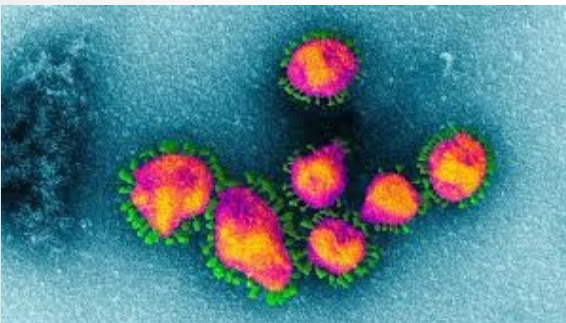
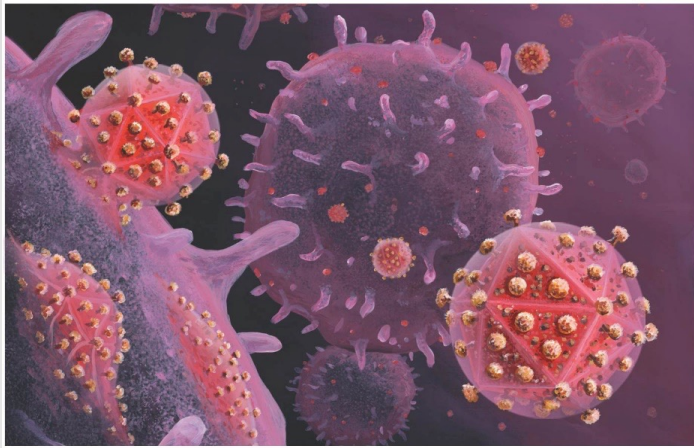
Grades

- **General Performance 30%**
 - Attendance, 20%
 - Quiz, 10% (materials from the last lecture, 10-15 min)
- **Seminar 30%**
 - Presentation, 25%
 - Participation in discussions, 5%
- **Final exam 40%**
 - Closed-book exam

Human vs. Virus

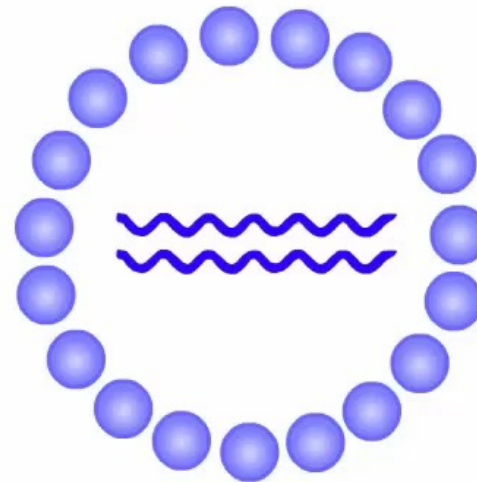
A long and on-going battle

What is a virus?



Nature.com

- An infectious particle consisting of **genes** packaged in a **protein** coat
- Cannot reproduce outside of a host cell



Virus

How do we fight with virus?

Vaccination!

Smallpox 天花

- **DNA** virus
- Egyptian mummies from 3000 years ago
- Killed 500,000,00+ people in history
- **Vaccination:** 1796, Edward Jenner



- Eliminated: 1980

Human Papillomavirus (HPV)

- **DNA** virus, >100 types
- High-risk HPV 16/18 is the primary cause of **cervical cancer** 宫颈癌
- Primarily transmitted through **sexual contact**
- **HPV vaccines** are highly effective in preventing infection with the most common cancer-causing types of HPV

The HPV Vaccine

VA



U.S. Department
of Veterans Affairs

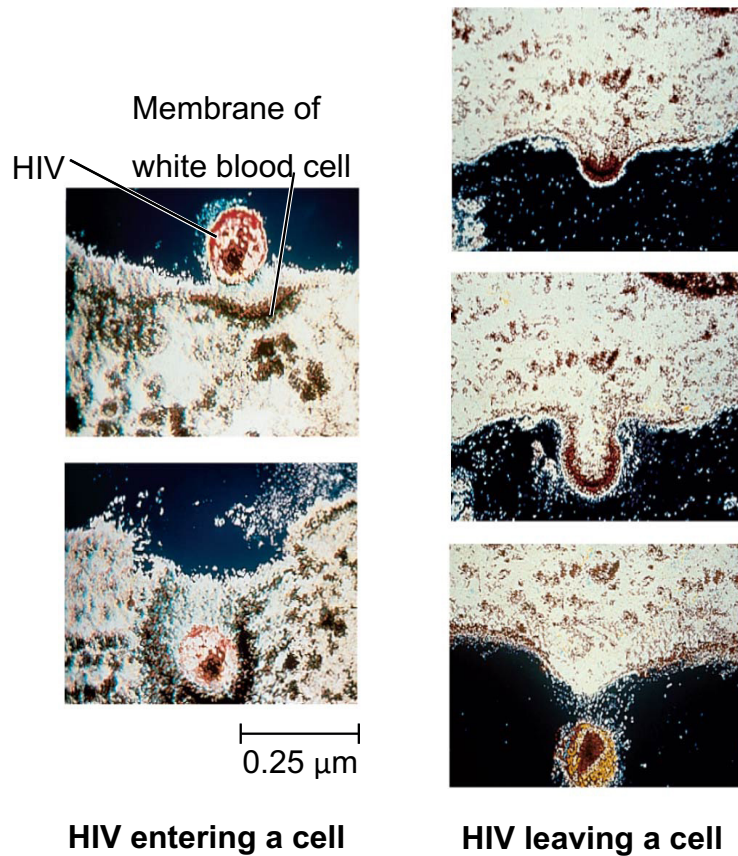
COVID-19

- RNA virus (mRNA)
- **mRNA vaccine:** The Nobel Prize in Physiology or Medicine 2023



HIV

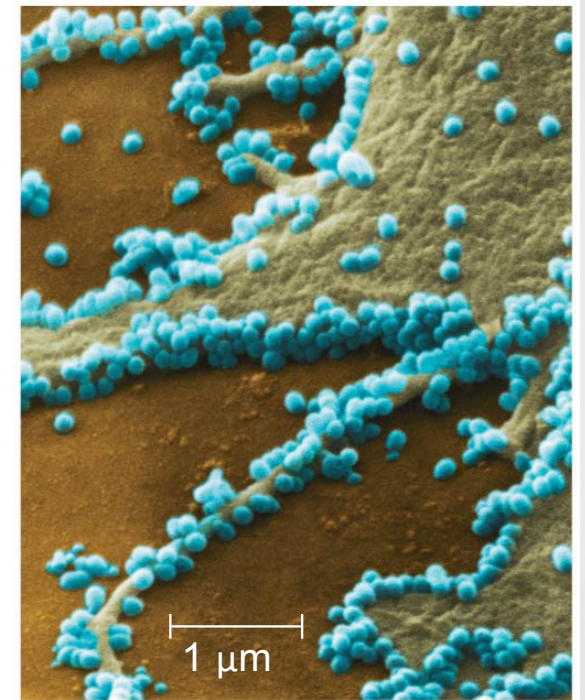
- Retrovirus (RNA→DNA)
- Integrate into host genome
- Damages the immune system



Most underestimated virus

- **Influenza 流感**

- RNA virus (template for mRNA), unstable
- HxNy:
 - 16 Hemagglutinin (H,血球凝集素) subtypes (x)
 - 9 neuraminidase (N,神经氨酸酶) subtypes (y)
- H1N1 pandemic in 2009: Swine Flu猪流感
- Over 500,000 deaths per year
- Flu shot every year
- Baloxavir marboxil 玛巴洛沙韦 (速福达)



**2009 pandemic H1N1
influenza A virus**

1918 Spanish Flu

- The Flu that ended WWI

100 YEARS AGO...

By:狼爸爸

讨论课 1

1. 有人认为应该销毁实验室中留存的天花病毒，也有人反对。这些看法分别有哪些依据，你的看法是什么？
2. 开发HIV疫苗的难度在哪，目前进展如何？
3. 你认为过去的十年中，生命科学领域最大的进展是什么？未来十年，你最期待的进展是什么？
4. 你相信地外生命吗？你认为一个星球形成生命的必要因素有哪些？
5. 为什么地球上的生命体，都以C作为分子骨架？为什么生命体中含量最高的三个分子是C、H、O，而且O含量最高？
6. 现在市面上有很多基因检测服务，如下图（图自网络）。你认为这个检测靠谱吗？你认为一份科学的基因检测报告应该包含哪些内容，不应包含哪些内容？

