Quiz :

1, 試用三個 Key concepts 來解釋生物演化。

2, Can you provide an example (not the one in the reading assignment) to explain “genetic drift”?

3, How important of Mendel genetics is to Darwin’s evolution theory?

4, 四海之內，皆兄弟也！ 這句話有科學根據嗎？

5, 怎麼樣才算真正完全回答 or 瞭解 what is life?

6, 生命能否存在於一個 close system? Explain your answer.

7, What is SNP? How does one specific SNP affect phenotype of the individual?

8, Why don’t use DNA as template for protein translation?

9, 1928年，[弗雷德里克·格里菲斯](https://zh.wikipedia.org/wiki/%E5%BC%97%E9%9B%B7%E5%BE%B7%E9%87%8C%E5%85%8B%C2%B7%E6%A0%BC%E9%87%8C%E8%8F%B2%E6%96%AF)發現了[轉化](https://zh.wikipedia.org/wiki/%E8%BD%89%E5%8C%96_%28%E7%94%9F%E7%89%A9%29)現象：死亡的細菌可以將遺傳物質「轉化」到其他依然活著的細菌內。這對分子生物學的影響是什麼？

10, 在 What is life 的演講中 Schrodinger 提出了一個解釋是百分之百的錯誤，你知道是那一個嗎?

11, 你覺得 Schrodinger 對分子生物學最重要的貢獻是什麼 (一句話就夠了!)?

12, 當我們討論 galaxies evolving (銀河的演化)時和生物演化間有什麼差別?

13, Darwin 和 Wallace 如何分別發展出他們”生物演化”的理論?

14, Marthus 怎麼影響 Darwin 的演化論?

15, Mendel 對 Darwin 的演化論有何重要性?

16, 打斷化學鍵會釋放能量出來嗎?

例如： ATP -> ADP + Pi

The best question of this week:

人類和猩猩基因之間的基因相差1.6%，是和哪種猩猩做比較?相差的基因又是甚麼? [為什麼想到這問題? 猩猩那麼多種，似乎有點過於攏統~1.6%便能造成如此大的差異，是否是非常重要的基因?]

Summary of my comments this week:

1. The second law of thermodynamics only holds for a close system. Living system is an open system. Therefore, we should consider internal world with its surrounding environment.
2. 想想看科學家為什麼常被笑話是在路燈底下找鑰匙！
3. Epigenetic modification becomes more important but they still come from evolution and selection. We will discuss this issue in the future.

生命的自主性 Can we understand what this means? How it is emerged from its constituents and what is underlying principle for its operation?

Virus is just a protein coated genetic program. The origin of virus is an interesting question. They use the same set of genetic code.

你的意思是？？present your idea in a specific and clear way, you will find the problem associated with your idea immediately.

Then you will see in simple organism one DNA sequence can code two or more different protein (overlapping gene). .

高中三年學了很多生物學的知識，但缺少深入的思考的習慣，這從你們對問題的討論可以看出。面對問題你們提出看法or解釋就停住了。提出的看法是否convincing？有沒有漏洞？有沒有証据支持？要練習整理自已學習過程中的思維。字數不是問題！要言之有物，要提出深刻而非trivial的問題，and elaborate your point clearly.

Not really, you may not know microRNA, non-coding RNA, etc. They play important regulatory or structure role. We will discuss this part in the later lecture.

Prenatal diagnosis is trying to eliminate person who carries defected gene. 你贊成保存這些defect genes in our human gene pool? 另一個值得思考的問題是gene editing. If we can correct defect in fertilized egg, what kind of risk we might be facing ?)

Gould 強調現代主義與後現代主義的差異，傳統物理學接近現代主義的一元論、化約論，而生物學則與強調多元、非化約的後現代主義相近。要瞭解生物學不能化約，而是整合。這也是最後那段話想要強調的意思。

Consider total variation among human genome may be over 10 millions. However, the frequency of appearing any particular variation is different. Some are very rare but some are quite frequent.