Science in Classics
经典中的科学

Tutorial 3: Darwin

This tutorial

- Video
- Discussion I (text)
- Discussion II (reflection)

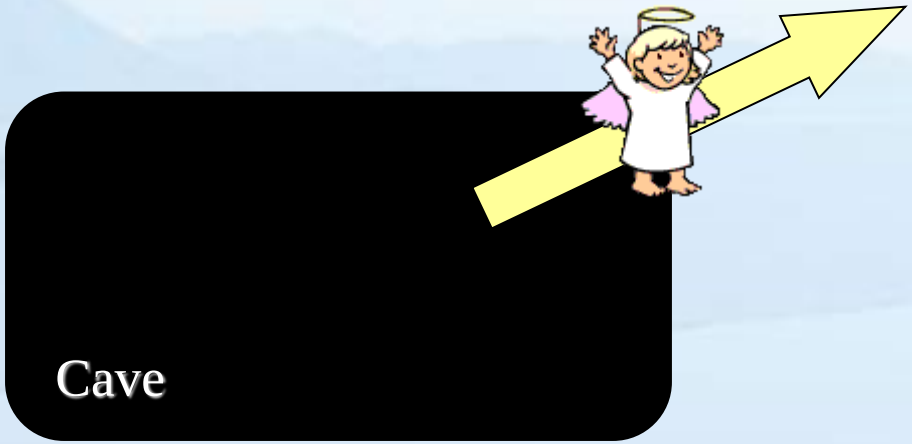
Allegory of the cave

1. “Science in Classics” is your journey to the outside of the cave.
2. Where are you?

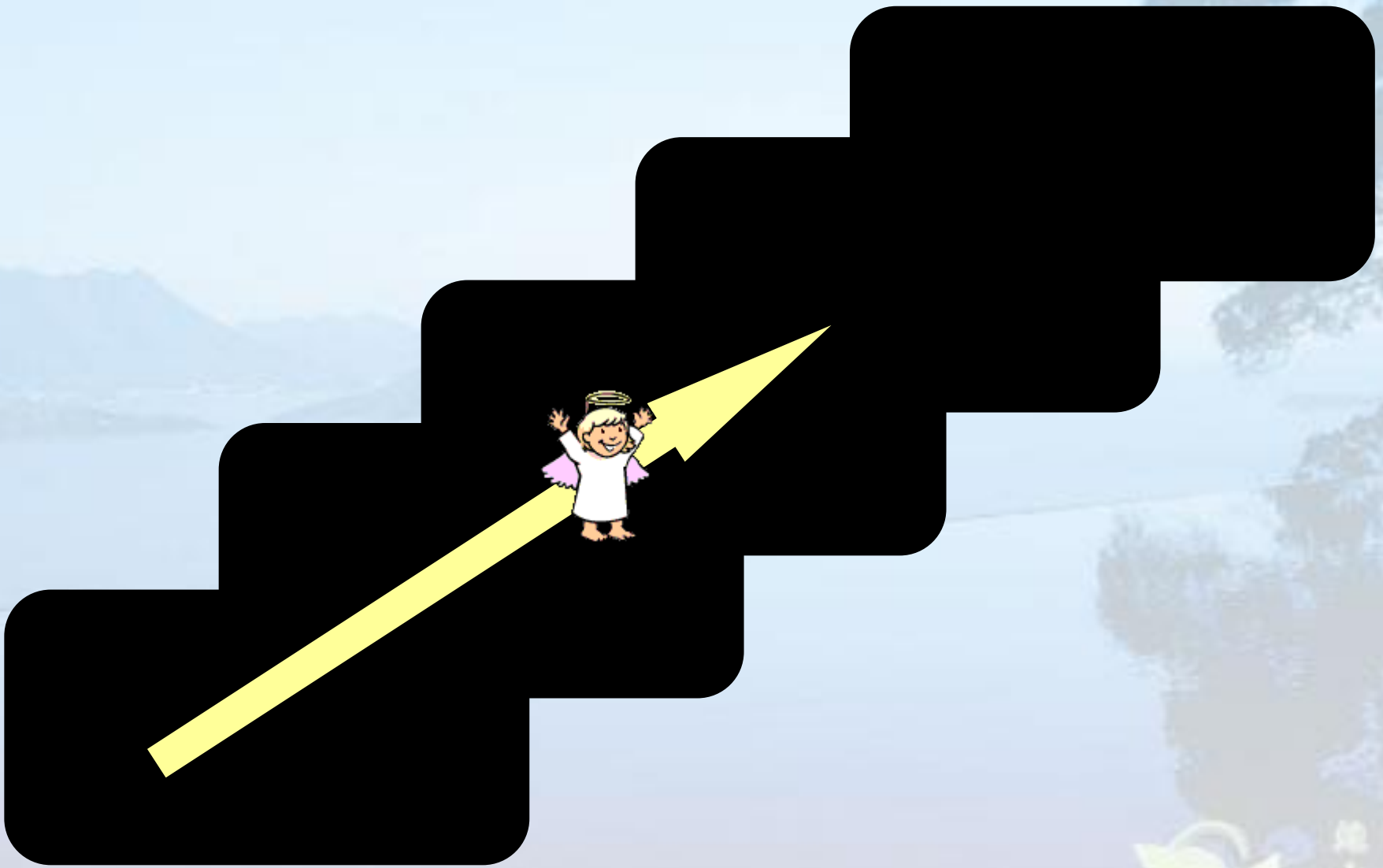
Are you inside the cave?

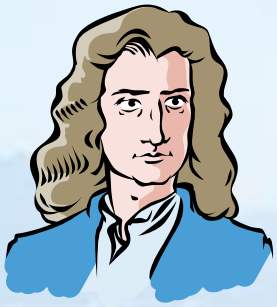
Are you outside the cave?

Or are you still on the way to outside?



Or are you in transit between caves?





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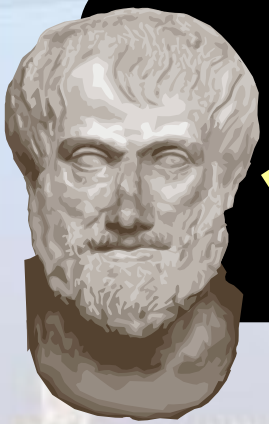
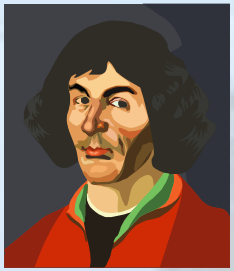




What about the scientists?

4. Were these scientists going towards the truth?

- “Male birds show off their beauty to attract females - David Attenborough - BBC wildlife”: http://youtu.be/gqsMTZQ-pmE

Discussion (Part I)

Text

Group 1: Natural selection

1a. (Para. 1-2) What does Darwin compare Natural Selection to? Is Natural Selection about competitions between individuals of the same species or different species? Any evidence?

1b. (Para. 10) What is sexual selection? What phenomenon can be explained by sexual selection but not by merely natural selection?

Group 2: Is Darwin really garrulous? (Para. 13-17)

Darwin illustrates natural selection with *many but not too many* examples. These examples are carefully chosen and are not just about natural selection.

Note: Para. 13-14 are about animals (wolves and preys). Para. 13 compares natural selection with man's selection. Para. 14 discusses the formation of varieties.

2a. Para. 15-16 are about plants. What characteristic of holly tree is Para. 16 about?

2b. Para. 17 is about plants and animals. What idea does Darwin want to put forth?

Group 3: Extinction

3a. (Para. 39) Which keyword appears 6 times? What is the precursor to extinction?

3b. (Para. 40-41) Why is a rare species less quickly modified or improved?

Groups 4/5: Divergence of character (Para. 42-43)

4a. What causes a variety to differ from its parents?

4b. Explain by domestic productions of pigeons how small variations accumulate. Why must Darwin explain the accumulation?

Group 6: Tree of life (Para. 50+, see Figure)

5a. Explain where Darwin has applied the concepts of "divergence of character" and extinction.

5b. Why did B become extinct first, then C and D?

5c. At a node, usually only outer branches can extend. Why is the tree drawn in this way?

Holly tree

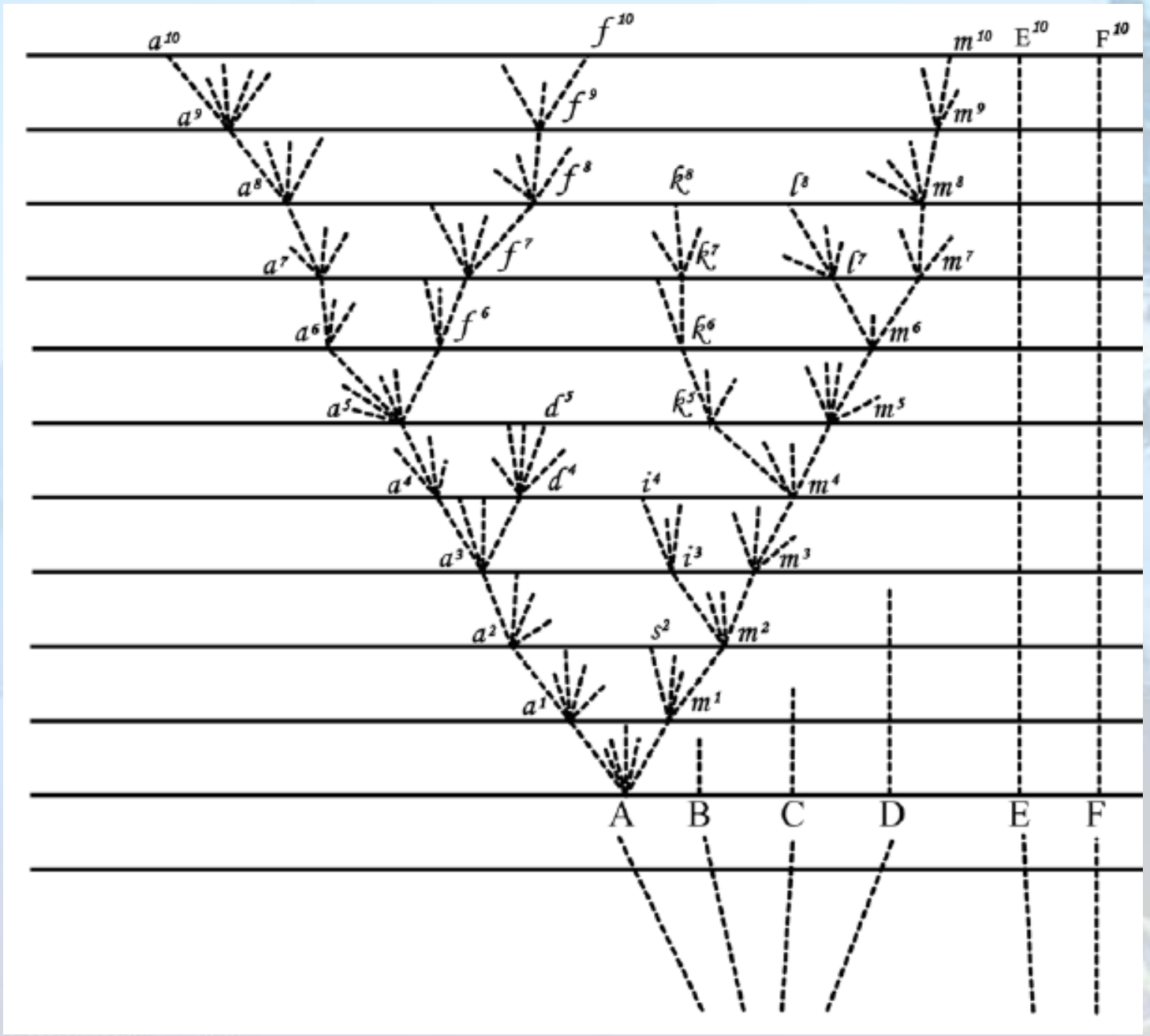
Extinction.—This subject will be more fully discussed in our chapter on Geology; but it must be here alluded to from being intimately connected with natural selection. Natural selection acts solely through the preservation of variations in some way advantageous, which consequently endure. But as from the high geometrical powers of increase of all organic beings, each area is already fully stocked with inhabitants, it follows that as each selected and favoured form increases in number, so will the less favoured forms decrease and become rare. Rarity, as geology tells us, is the precursor to extinction. We can, also, see that any form represented by few individuals will, during fluctuations in the seasons or in the number of its enemies, run a good chance of utter extinction. But we may go further than this; for as new forms are continually and slowly being produced, unless we believe that the number of specific forms goes on perpetually and almost indefinitely increasing, numbers inevitably must become extinct. That the number of specific forms has not indefinitely increased, geology shows us plainly; and indeed we can see reason why they should not have thus increased, for the number of places in the polity of nature is not indefinitely great,—not that we have any means of knowing that any one region has as yet got its maximum of species. Probably no region is as yet fully stocked, for at the Cape of Good Hope, where more species of plants are crowded together than in any other quarter of the world, some foreign plants have become naturalised, without causing, as far as we know, the extinction of any natives.

40 Furthermore, the species which are most numerous in individuals will have the best chance of producing within any given period favourable variations. We have evidence of this, in the facts given in the second chapter, showing that it is the common species which afford the greatest number of recorded varieties, or incipient species. Hence, rare species will be less quickly modified or improved within any given period, and they will consequently be beaten in the race for life by the modified descendants of the commoner species.

Divergence of Character:—The principle, which I have designated by this term, is of high importance on my theory, and explains, as I believe, several important facts. In the first place, varieties, even strongly-marked ones, though having somewhat of the character of species—as is shown by the hopeless doubts in many cases how to rank them—yet certainly differ from each other far less than do good and distinct species. Nevertheless, according to my view, varieties are species in the process of formation, or are, as I have called them, incipient species. How, then, does the lesser difference between varieties become augmented into the greater difference between species? That this does habitually happen, we must infer from most of the innumerable species throughout nature presenting well-marked differences; whereas varieties, the supposed prototypes and parents of future well-marked species, present slight and ill-defined differences. Mere chance, as we may call it, might cause one variety to differ in some character from its parents, and the offspring of this variety again to differ from its parent in the very same character and in a greater degree; but this alone would never account for so habitual and large an amount of difference as that between varieties of the same species and species of the same genus.

Chance (internal): longer ⇨ shorter ⇨ shorter ⇨ longer ⇨ shorter ⇨ longer ⇨ longer ⇨ …

Natural selection (external): accumulation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Discussion (Part II)

Reflection

Hill Myna (*Gracula religiosa* /鹩哥/九宫鸟)

Subtitle: Mrs. Wong

Aviary Pagoda, Yuen Long Park
元朗公园百鸟塔

Myna Bird (鹩哥)

6. The myna bird can mimic human speech. Why did it evolve in this way?

Polar Bear

7. Crypsis (保护色) can hide a prey. The polar bear has no natural enemy in the polar region. Why does it have crypsis?

A new species

8. A new species is found in Xidian University.
It is small like a frog but it has a crocodile head.
How will you call it? What is its origin?

~~**Darwin and Newton**~~

~~9. What similarities can you find between how Darwin explained the world of life and how Newton explained the mechanical universe?~~

About life

10. What aspects of life is Darwin's theory about? [e.g. meaning? origin? purpose?]

Reminder

- Reflective Journal 1: 21 May (Saturday, 9pm)
- Quiz 2 (on Carson): before 24 May (2pm)