

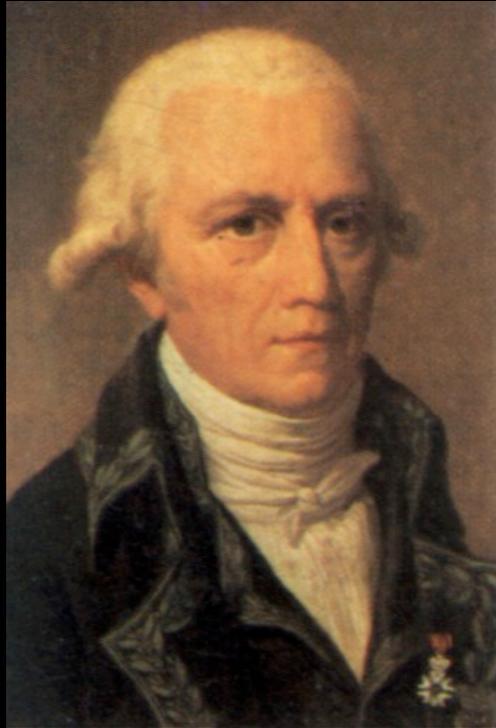
Questions from Last Class

- What is the Great Chain of Being? Why is it important?
 - When did ideas about the world change from this?
- What impact did each of the following people have on evolutionary thought? What ideas are associated with them?
 - Linnaeus
 - Buffon
 - Cuvier

And Lamarck...

- What was Lamarck's contribution to evolutionary thought?
- What was right and what was wrong about his evolutionary explanation?

Jean-Baptiste Lamarck



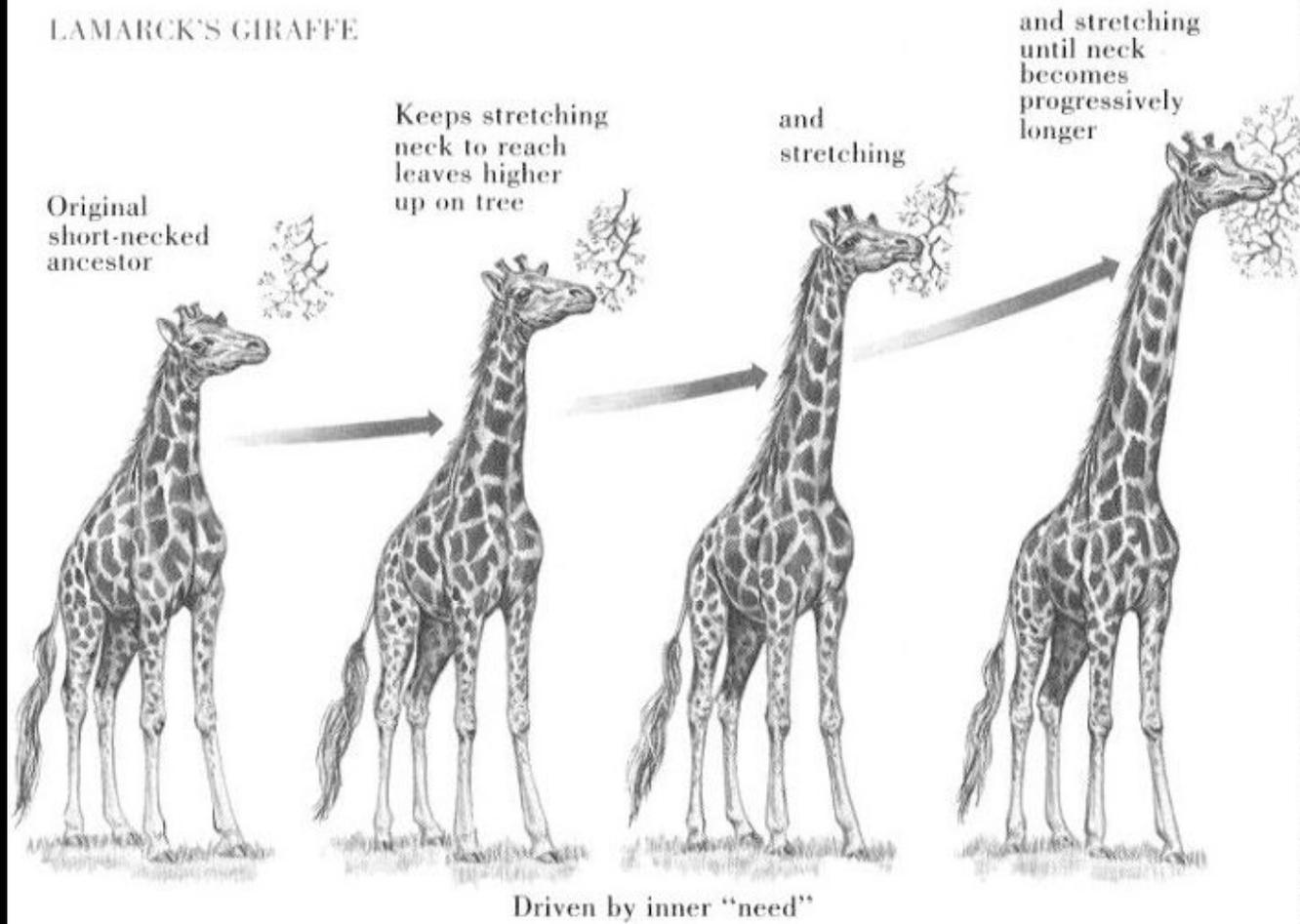
Inheritance of Acquired Characteristics

proposes that changes occur during the lifetime of an individual, through use or disuse, can be passed on to the next generation

Elephant's Child?

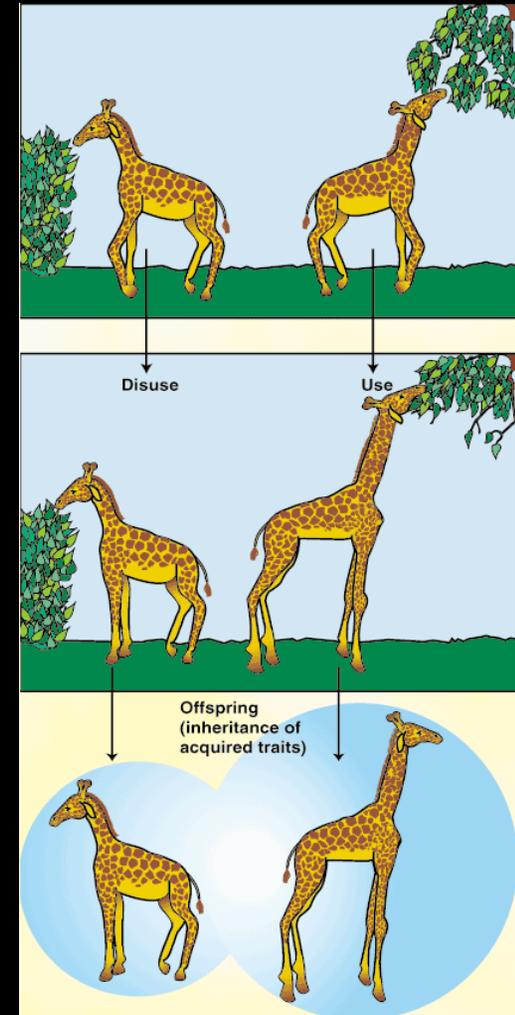


LAMARCK'S GIRAFFE



Inheritance of Acquired Characteristics

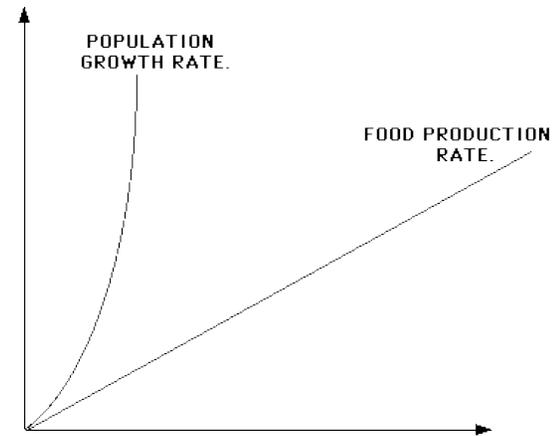
1. Frequent and continuous use of an organ strengthens and enlarges it, permanent disuse causes it to weaken, deteriorate and disappear
2. Acquisitions and losses are preserved through reproduction



Influences on Darwin

- Buffon
- Cuvier
- Lamarck
- Malthus
- Lyell

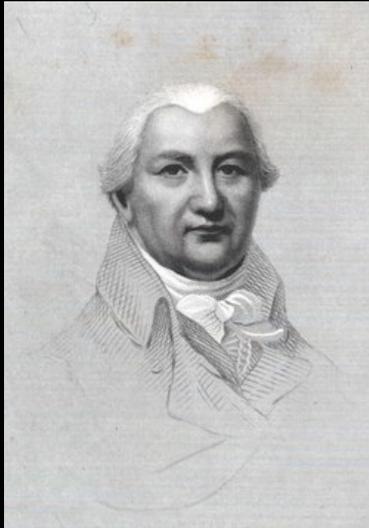
Thomas Malthus



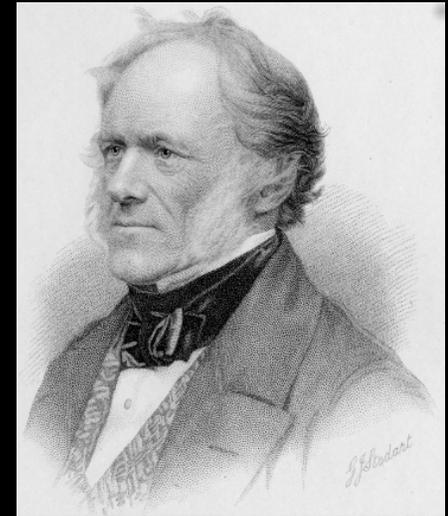
“A struggle for existence”

Uniformitarianism

the same processes
that act on the earth
today acted on the
earth in the past



Hutton



Lyell

Charles Darwin



Some of the Finches of the Galapagos



small ground finch

medium ground finch

large ground finch



sharp-beaked ground finch



cactus finch



large cactus finch



small tree finch



large tree finch?



vegetarian finch

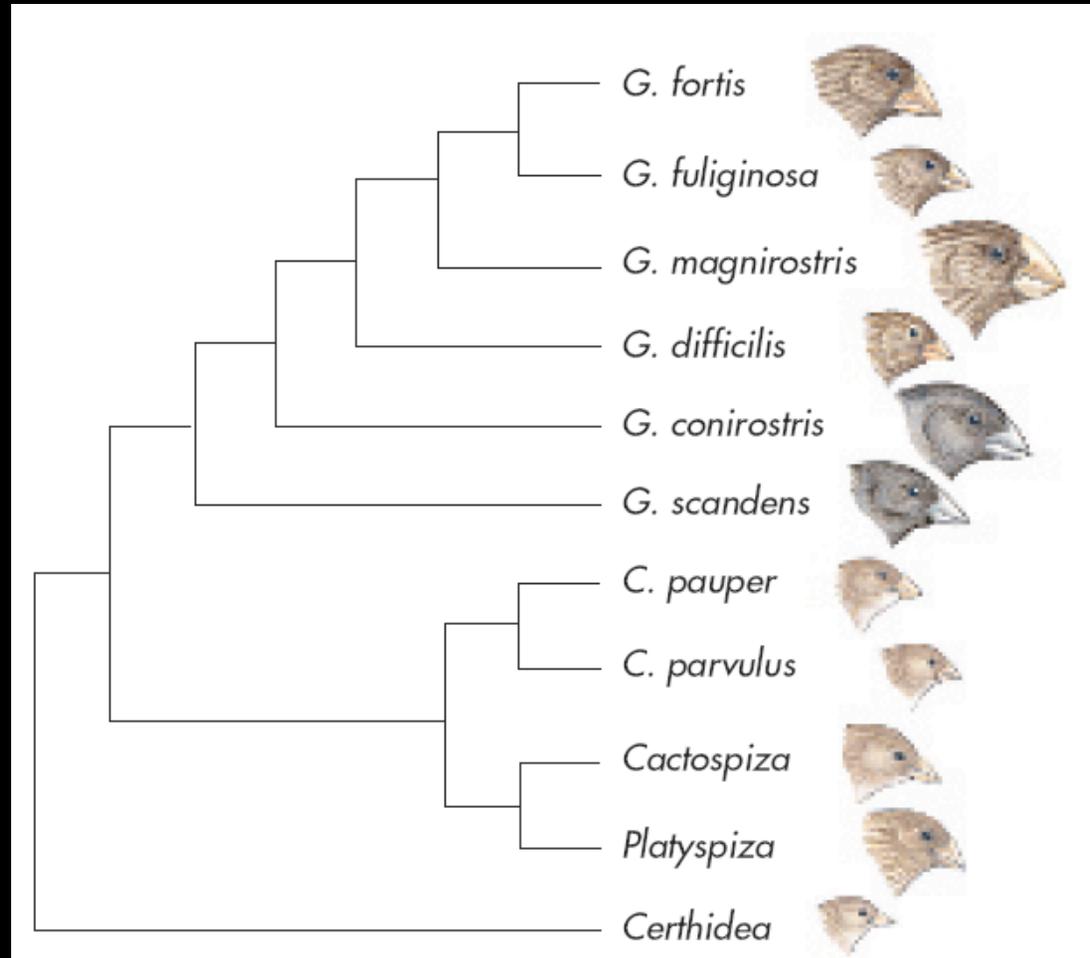


woodpecker finch



warbler finch

Organizing the finches



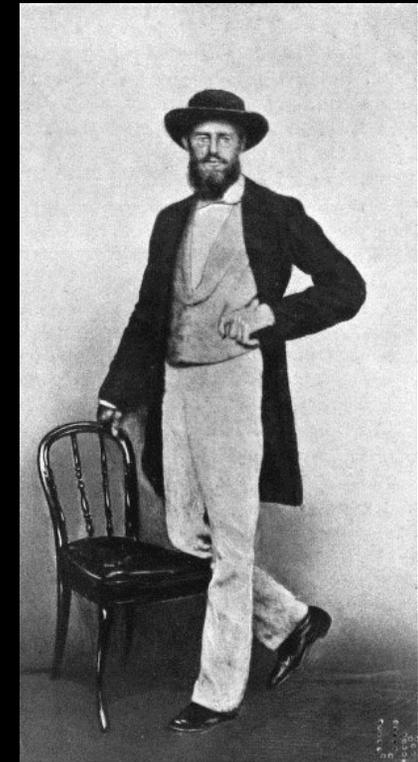
“I have been now ever since my return engaged in a very presumptuous work & which I know no one individual who wd not say a very foolish one.— I was so struck with distribution of Galapagos organisms &c &c & with the character of the American fossil mammifers, &c &c that I determined to collect blindly every sort of fact, which cd bear any way on what are species. — I have read heaps of agricultural & horticultural books, & have never ceased collecting facts — At last gleams of light have come, & I am almost convinced (quite contrary to opinion I started with) that species are not (it is like confessing a murder) immutable. Heaven forbend me from Lamarck nonsense of a “tendency to progression” “adaptations from the slow willing of animals” ... but the conclusions I am led to are not widely different from his — though the means of change are wholly so — I think I have found out (here’s presumption!) the simple way by which species become exquisitely adapted to various ends.”

Letter to Hooker

The Darwin Project
<http://www.darwinproject.ac.uk/>

Letter to Wallace, 1857

“By your letter & even still more by your paper in Annals, a year or more ago, I can plainly see that we have thought much alike & to a certain extent have come to similar conclusions.”



To Lyell, 1858: You said this when I explained to you here very briefly my views of “Natural Selection” depending on the Struggle for existence.—I never saw a more striking coincidence. if Wallace had my M.S. sketch written out in 1842 he could not have made a better short abstract! Even his terms now stand as Heads of my Chapters.

"But with regard to the material world, we can at least go so far as this—we can perceive that events are brought about not by insulated interpositions of Divine power, exerted in each particular case, but by the establishment of general laws."

W. WHEWELL: *Bridgewater Treatise*.

"To conclude, therefore, let no man out of a weak conceit of sobriety, or an ill-applied moderation, think or maintain, that a man can search too far or be too well studied in the book of God's word, or in the book of God's works; divinity or philosophy; but rather let men endeavour an endless progress or proficience in both."

BACON: *Advancement of Learning*.

Down, Bromley, Kent,
October 1st, 1859.

ON
THE ORIGIN OF SPECIES

BY MEANS OF NATURAL SELECTION,

OR THE
PRESERVATION OF FAVOURED RACES IN THE STRUGGLE
FOR LIFE.

By CHARLES DARWIN, M.A.,

FELLOW OF THE ROYAL, GEOLOGICAL, LINNEAN, ETC., SOCIETIES;
AUTHOR OF 'JOURNAL OF RESEARCHES DURING H. M. S. BEAGLE'S VOYAGE
ROUND THE WORLD.'

LONDON:
JOHN MURRAY, ALBEMARLE STREET.
1859.

The right of Translation is reserved.

Elements of the Theory

- All species are capable of producing offspring faster than the food supply increases - there will be a struggle for existence

Elements of the Theory

- All species are capable of producing offspring faster than the food supply increases - there will be a struggle for existence
- **All living things show variation**

Elements of the Theory

- All species are capable of producing offspring faster than the food supply increases -- there will be a struggle for existence
- All living things show variation
- **Favorable variations will offer an advantage in the struggle for existence**

Elements of the Theory

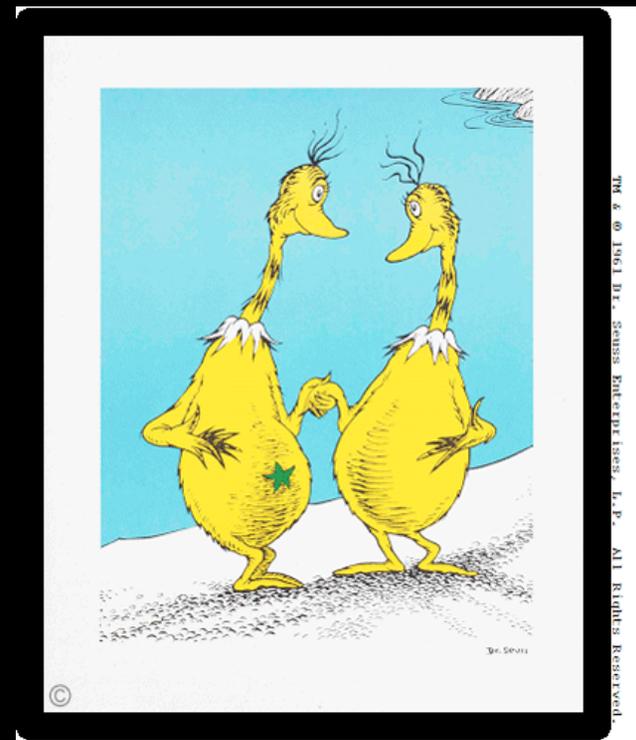
- All species are capable of producing offspring faster than the food supply increases -- there will be a struggle for existence
- All living things show variation
- Favorable variations will offer an advantage in the struggle for existence
- **These variations, when heritable will be passed on to the next generation and will increase in frequency over time, changing the population**

Natural Selection

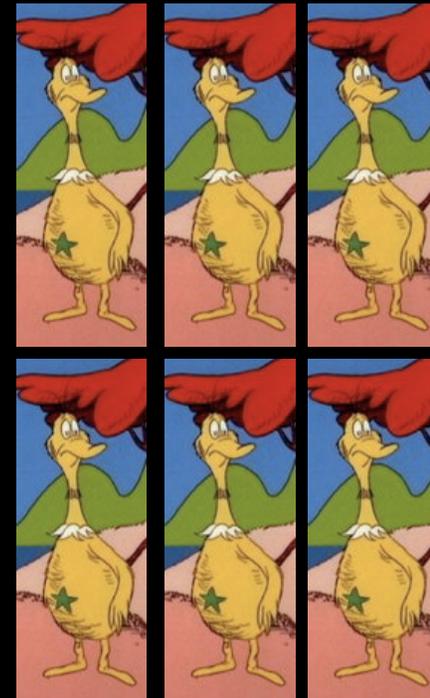
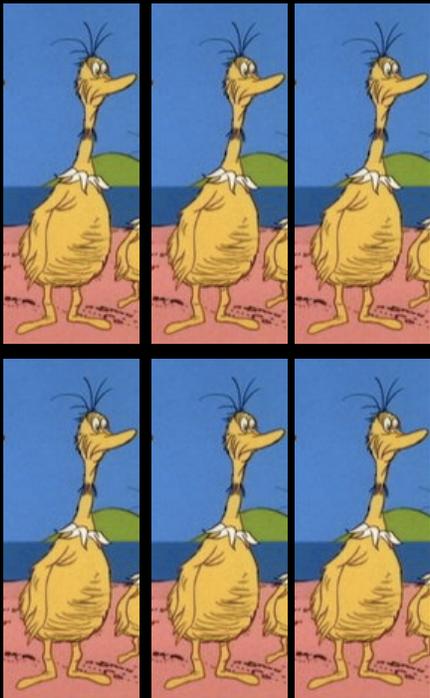
- Competition
- Variation
- Heritability
- Differential Reproduction

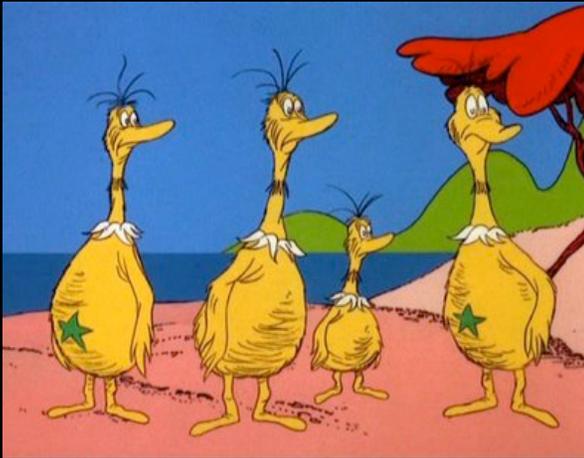
Example

- Two kinds of Sneetches
- Those with bellies without stars and those with stars upon thars



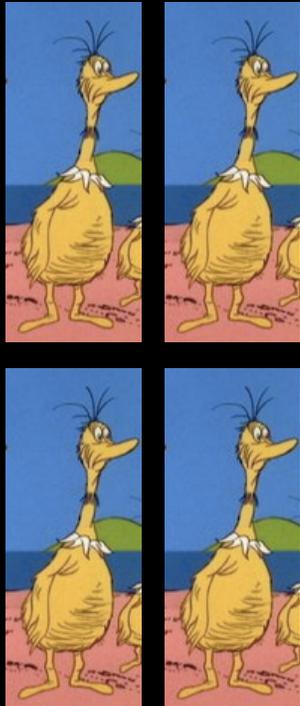
In the beginning....





The Star Belly Sneetches had more fun on the beaches

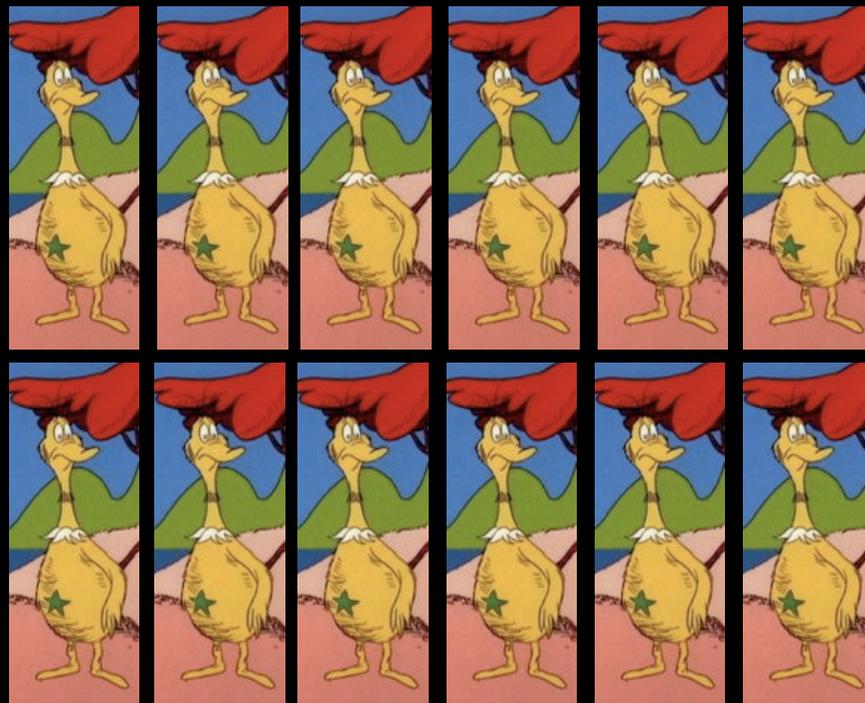
Over time...



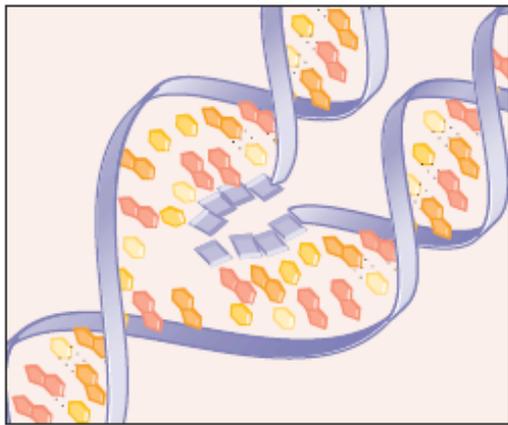
More time...



And then...



Natural Selection



(a) Mode of inheritance



(b) Variation among individuals



(c) Environmental pressure

+ Differential Reproduction

Elephant's Child?

