

Concepts of Biology. Lecture 31

Alexey Shipunov

Minot State University

November 19, 2014



1 Where we are?

2 Inheritance

- Genes and chromosomes

3 Life in Paleozoic era

- From Carboniferous to Permian



Outline

1 Where we are?

2 Inheritance

- Genes and chromosomes

3 Life in Paleozoic era

- From Carboniferous to Permian



1 Where we are?

2 Inheritance

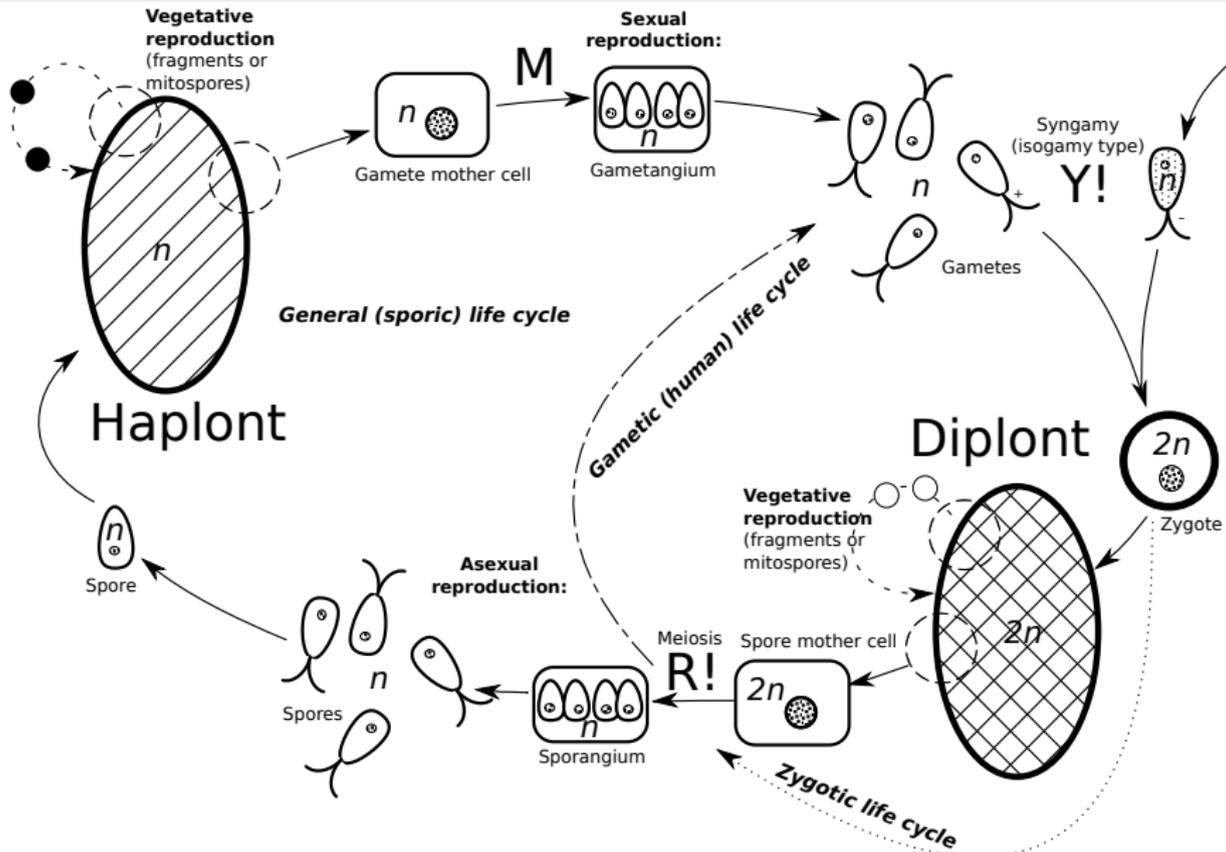
- Genes and chromosomes

3 Life in Paleozoic era

- From Carboniferous to Permian



Life cycle of multicellular organism



Mendel's theory

- Two different factors (variants of one character)
- Factors are paired in plant but separated in gametes
- One factor is dominant
- Different characters are separating between gametes independently
- This is because different characters are located in different places



Mendel's theory and explanation

- Two different factors (variants of one character): *two variants (alleles) of one gene*
- Factors are paired in plant but separated in gametes: *meiosis*
- One factor is dominant: *one variant is working DNA, the other is not*
- Different characters are separating between gametes independently: *anaphase I of meiosis*
- This is because different characters are located in different places: *in different pairs of chromosomes*



Inheritance

Genes and chromosomes



Thomas Hunt Morgan and fruit fly

- Grey with normal wings \times black with reduced wings: in first generation, all same (gray normal) but in second generation only two groups: 3/4 gray normal and 1/4 black reduced!
- BUT if you count thousands of fruit flies, few recombinants may be found
- WHY?



Linkage and crossing-over

- If genes are located in the same chromosome, they are **linked** and will not be inherited independently
- However, linkage could be broken in **crossing-over** (it runs in prophase I of meiosis)



Sex and chromosomes

- One gender has the pair where chromosomes are non-equal
- Deviating chromosome is sex chromosome, it contains small number of genes
- Two variants are possible: XY (mammals, fruit fly, ginkgo tree) and ZW (birds, butterflies)
- In both cases, sexes are 1:1
- The gender where chromosomes are equal often has the second chromosome inactivated (i.e., Barr body in human female cells)
- The gender where chromosomes are non-equal is more susceptible to mutations because all mutations in main chromosome will be manifested (it has no counterpart)



Life in Paleozoic era

From Carboniferous to Permian



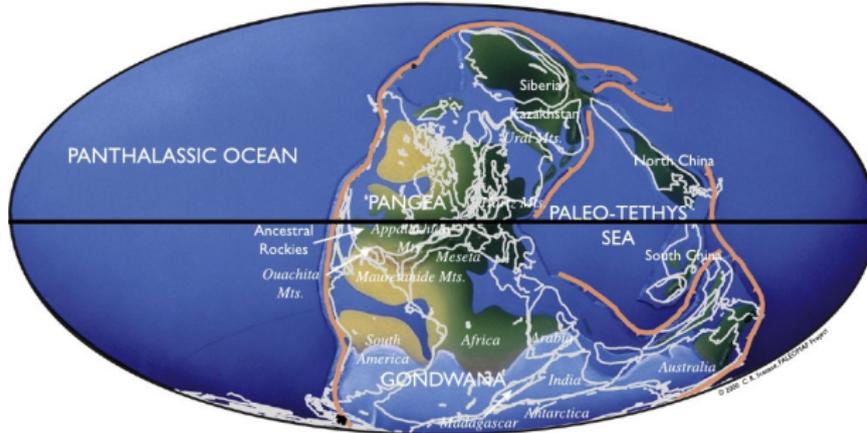
From Carboniferous to Permian

- Devonian period: 419 Mya
- Carboniferous period: 358 Mya
- Permian period: 299–252 Mya



Carboniferous period

306 Ma Carboniferous

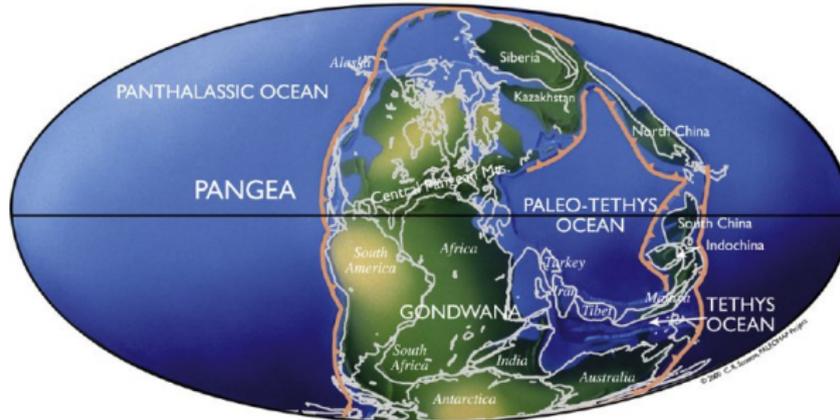


- Hot, wet tropical climate in Europe and North America (Laurasia), dry arctic forests in Siberia (Angarida)
- Pteridophyte and primitive seed plants forests dominated tropics, insects started to fly
- Reptiles appeared



Permian period

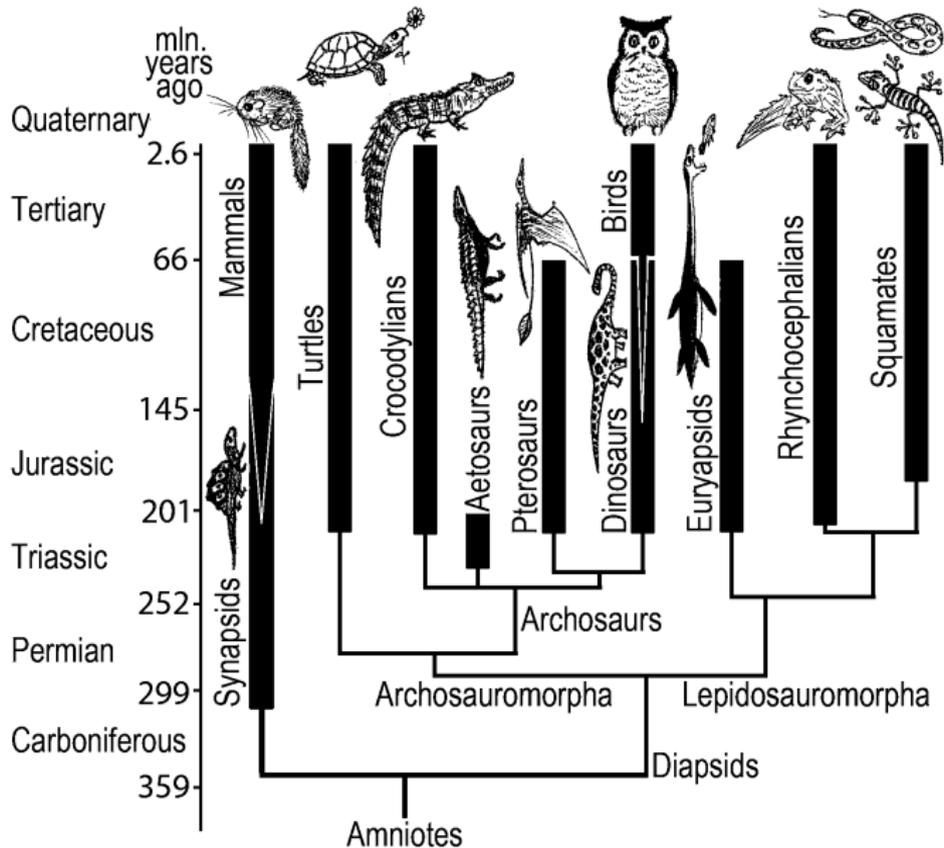
255 Ma Permian



- Last period of Paleozoic era, ended with a mass extinction in the sea and also on land
- Pangea formed, with a giant central desert
- Primitive synapsid reptiles dominated the land



Following the movie: reptiles, mammals and birds



Summary

- Chromosome (Morgan) approach added linkage, crossing-over and sexual chromosomes to the principles discovered by Mendel



For Further Reading



Linkage.

http://en.wikipedia.org/wiki/Genetic_linkage



Sex chromosomes.

http://en.wikipedia.org/wiki/Sex_chromosome



Permian.

<http://en.wikipedia.org/wiki/Permian>

