

# Biogeography. Lecture 4

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January 27, 2014



# Outline

## Physical geography

Basics of climatology

## Palaeogeography

Geological time

Plate tectonics



# Outline

## Physical geography

Basics of climatology

## Palaeogeography

Geological time

Plate tectonics



# Physical geography

## Basics of climatology



# Seasons and climates

- ▶ Geographical zones: arctic, temperate and tropical
- ▶ Koeppen climates: A, tropical; B, dry; C, mild mid-latitude; D, cold mid-latitude; and E, polar

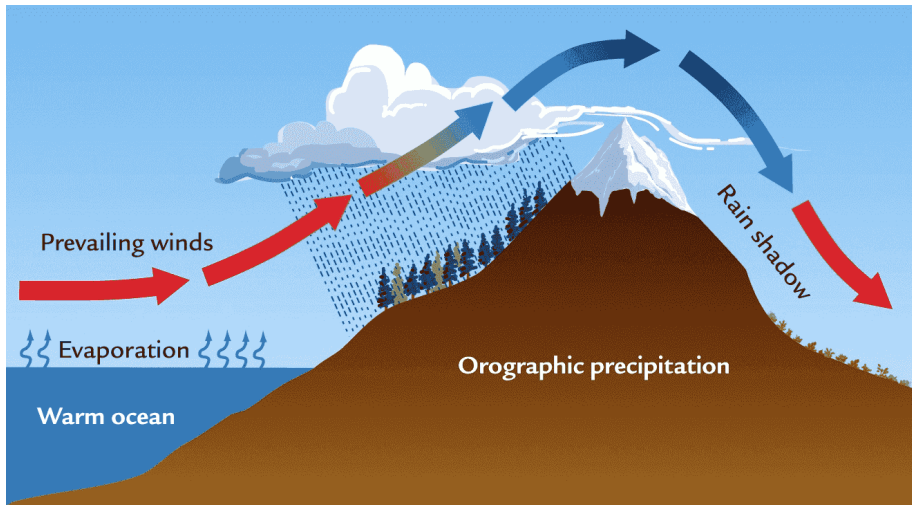


# Climate and altitude

- ▶ Sea warming and rain shadow
- ▶ Altitudinal zones: lowland, montane, subalpine, alpine and snow



# Sea warming and rain shadow



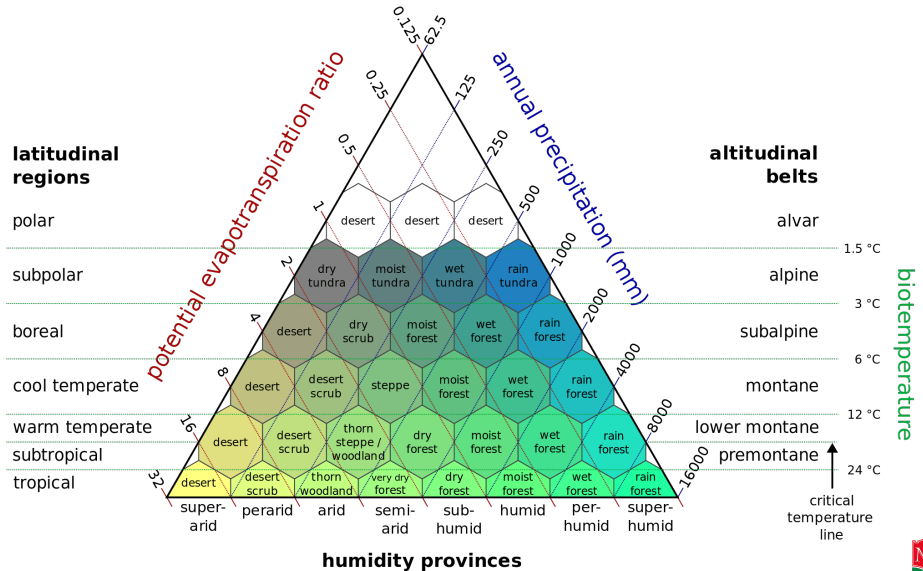
# Climate and life

- ▶ Life zones are basing on temperature and precipitation
- ▶ Ideal continent





# Holdridge life zones



# Palaeogeography

## Geological time



# First attempts to calculate age of Earth

- ▶ Helmholtz (1853) calculated that if Sun is shrinking to obtain the energy, then the age of Earth should not exceed 18 My (millions of years, 18,000,000 years)
- ▶ Lyell (1830) calculated that if the speed of sedimentation was the same in the past, then age of Earth should be approximately 200 My



# Use of radioactivity

- ▶ In 1896, Becquerel discovered radioactivity. It was found that some atoms are constantly breaking into smaller ones, sometimes with very slow speed
- ▶ Consequently, it is possible can calculate the age of mineral from the concentration of radioactive elements

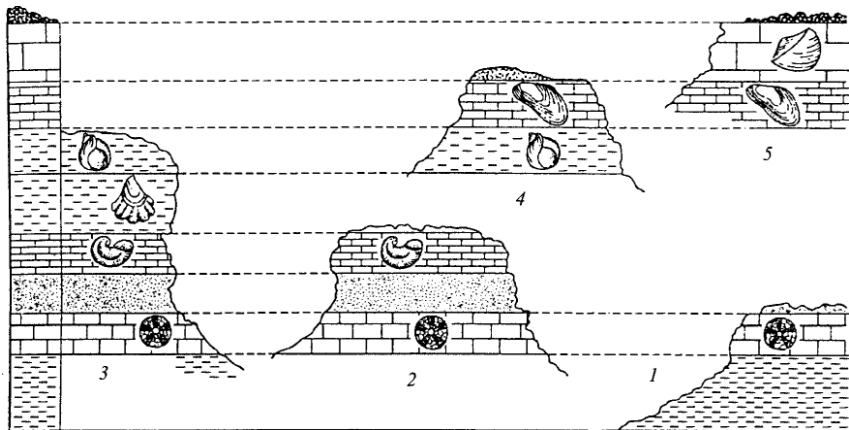


# Stratigraphy

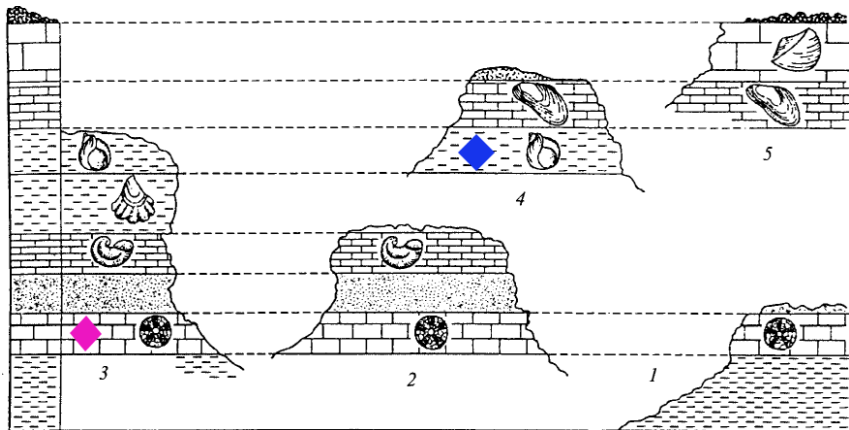
- ▶ Upper layers are younger than lower
- ▶ Two layers contained similar species of fossils have the same time of origin



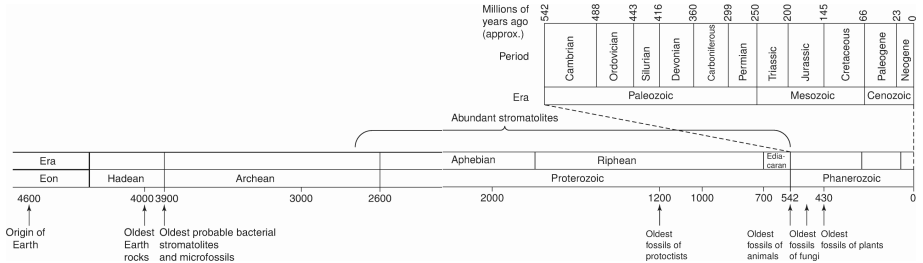
# How stratigraphy works



# Stratigraphy and radioactivity work together

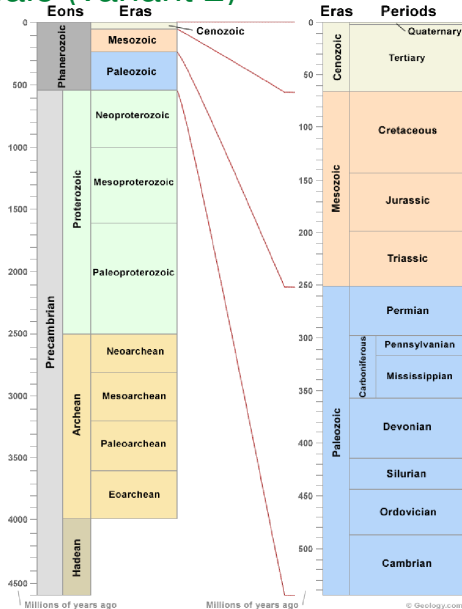


# Geological scale





# Geological scale (variant 2)



# Palaeogeography

## Plate tectonics

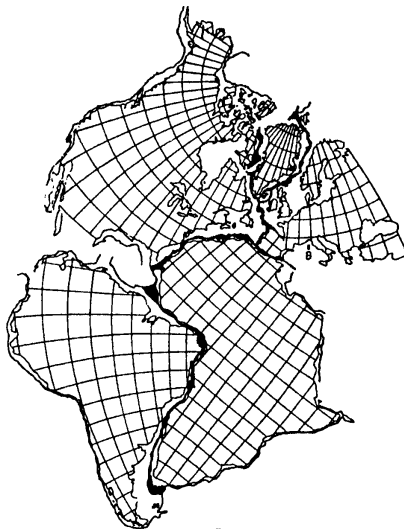


# Continental drift

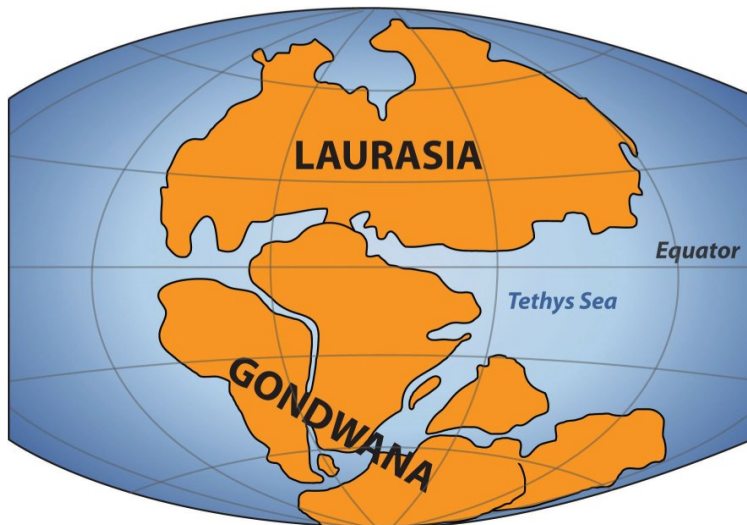
- ▶ In 1921, Alfred Wegener invented the idea that South America and Africa were parts of one big continent—Gondwana.
- ▶ According to Wegener, in the end of Paleozoic era, there were two big continents—Gondwana and Laurasia separated by Tethys ocean
- ▶ Before that, all continents were united in one—Pangaea surrounded by one big ocean.



# One of Vegener's arguments



# Laurasia and Gondwana



# Pangaea



# Mantle convection

- ▶ The driving force of floating continents is a **mantle convection**
- ▶ In ocean ridges, new ocean cortex is constantly forming and expanding
- ▶ In ocean trenches and continental ridges, different plates are colliding and often forming mountains



# Summary

- ▶ Geological time is calculated on the basis of both relative (stratigraphy) and absolute (radioactivity) methods
- ▶ Continents of Earth are constantly changing their position due to the mantle convection (“plate tectonics”)
- ▶ In the past (Permian period) all continents formed super-continent Pangaea, which then broke into Laurasia and Gondwana





# For Further Reading



A. Shipunov.

*Biogeography* [Electronic resource].

2014—onwards.

Mode of access:

[http://ashipunov.info/shipunov/school/biol\\_330](http://ashipunov.info/shipunov/school/biol_330)



Climate.

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

