earlier we saw that, through deep time, there have occurred unique patterns of:

- lineage splitting - biotic diversification
- continent movement, splitting & joining
- geographic dispersal of biota

this has generated distinctive biotas -

- the **Biogeographic Realms**

16 1

we also saw last time that, through

differential heating of the earth's surface

and through earth's axis tilt

our planet shows

latitudinal *climate belts*
of **varying *seasonality***

which generate **typical soil, productivity and species-richness patterns**

16 2

we now put these two patterns together:

- **DISTINCT REALM BIOTAS**
- **LATITUDINAL CLIMATE ZONES**

and ask:
1. how they interact, &
2. what this interaction generates

1. Natural Selection; ADAPTATION
2. EVOLUTIONARY CONVERGENCE

16 3

what happens to any evolutionary lineage as it develops through time?

- **it splits, generating (many) new species**
- **these species adapt to the environmental circumstances encountered**

ADAPTIVE RADIATIONS

different lineages in ***similar environments***
often generate ***similar adaptations***…

16 4

Adaptive Radiation on Islands

Hawaii is extremely isolated. Its ***few colonist groups*** have radiated into ***diverse ways of life***, producing ***diverse species*** which ***closely resemble*** those from ***other groups*** elsewhere in the world:
CONVERGENT FORMS

Hawaiian Honeycreepers

Islands provide **MANY** other examples

- **Lettuces on Juan Fernandez**
- **Sunflowers on St. Helena**

but evolutionary convergence is not restricted to island radiations……

there are a great many examples from many lineages & life-styles

16 6

pterosaurs

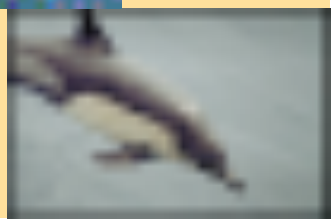
ADAPTATION to FLIGHT

birds

7

ADAPTATION to predatory chasing in the OCEAN

mammals



Giant Armadillo
S. America

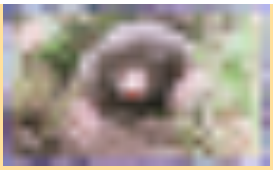
ADAPTATION for "ANTEATING"

note heavy forelimbs for digging

Pangolin
Africa + Asia

9

mole cricket



mammalian mole

ADAPTATION for BURROWING

on a global scale, these
parallel adaptations in ***different lineages***
to ***similar climates*** on ***different continents***

are recognised as BIOMES

"... . the signature of climate written by natural selection on the page of the resident biota... .."

most readily seen in the life-form of the vegetation.... *(why?)*

16

11

Euphorbias - Africa

cactus - Americas

ADAPTATION to ARIDITY

so, similar climates bring out arrays of equivalent life-forms from different plant groups on the different continents

these similar arrays are **Biomes**

thus we can recognise, say, a desert, by its characteristic vegetation without knowing what the groups are

16 14

the variation shown by plant growth-forms has long been known

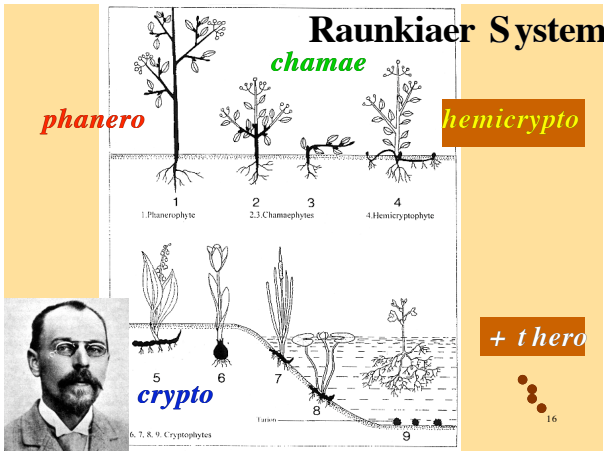
Raunkiaer's System

based on perennating structures

also well-known is the **non-random distribution** of these forms **among the world's natural regions**

biomes have distinct and typical arrays of life-forms

16 15



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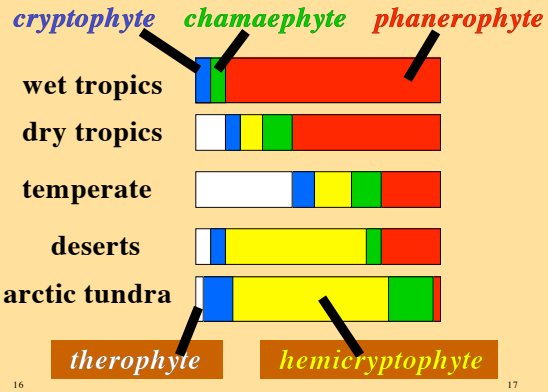


16 17

abundances of Raunkiaer's types suggest the **adaptive value of body forms**

e.g. Arctic - all plants cryptic; no trees

e.g. Tropics - trees, epiphytes, vines; no seeds

as well as gross body form, there are many other typical physical attributes

tiny leaves in desert trees
needle-leaves in taiga trees
succulents in arid climates

16 18

NEXT CLASS

Overview of Biomes & their Climates

16 19

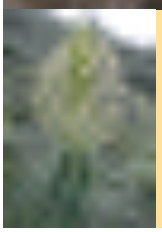
Africa & Asia

ADAPTATION to DESERT LIFE

bipedality

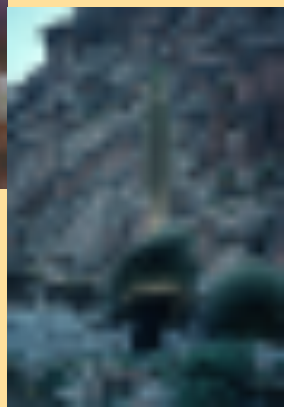
North America

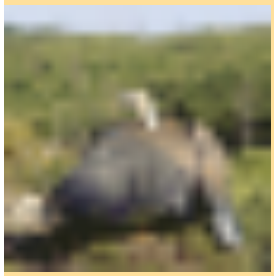
20



Mauna Kea

Andes

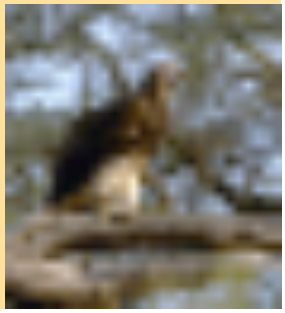




Old World Vultures
- eagle relatives

16

ADAPTATION to SCAVENGING



ADAPTATION to SCAVENGING

New World "vultures"
- stork relatives