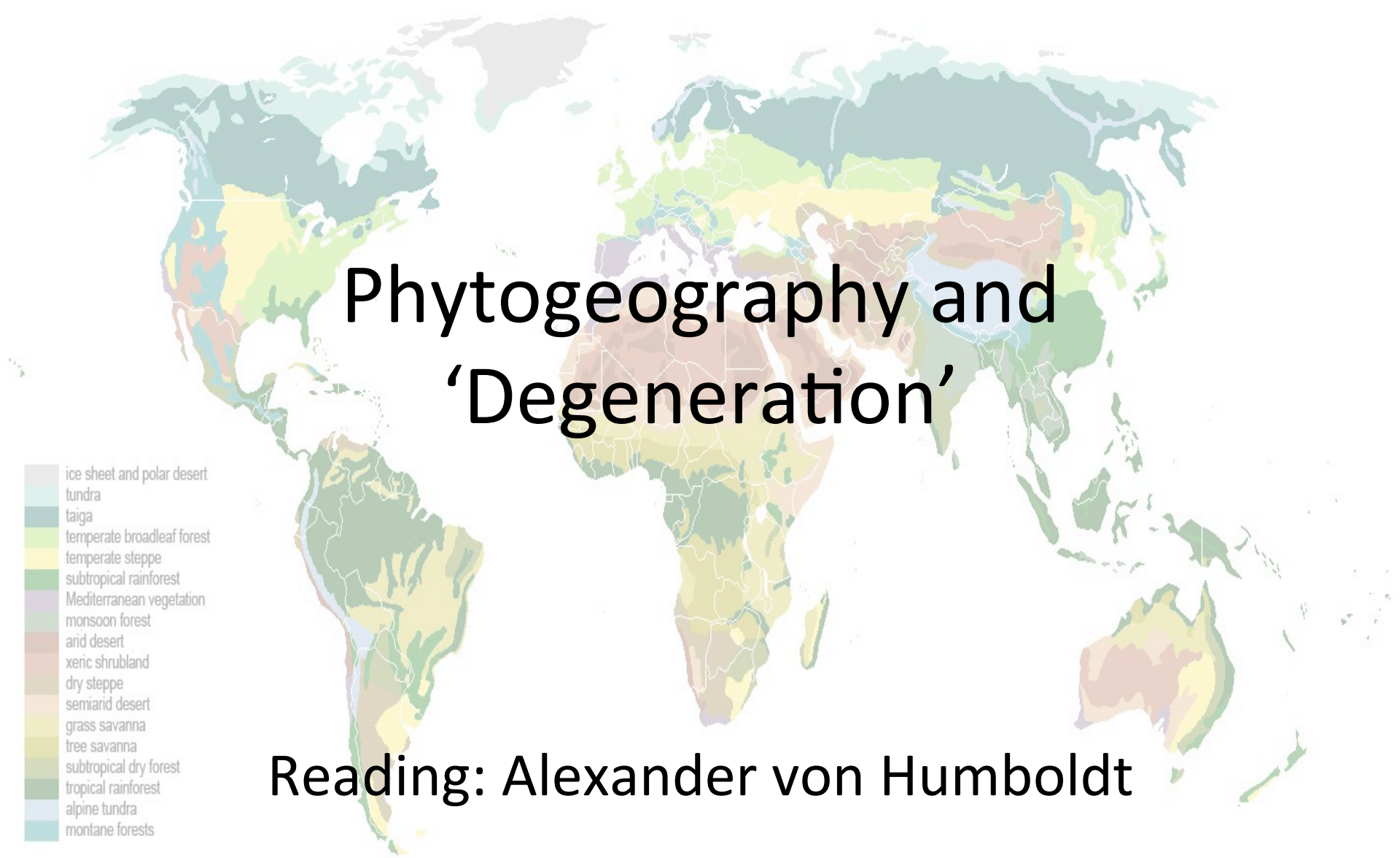
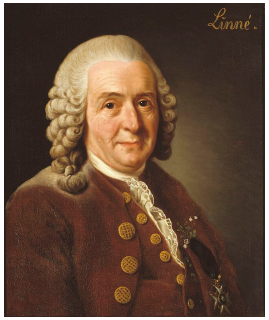


Phytogeography and 'Degeneration'

Reading: Alexander von Humboldt

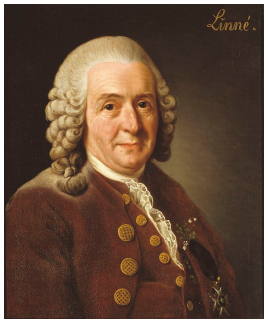
Classical Biogeography: Early Perspectives

Lecture 1 Recap



Carl Linnaeus

Compte de Buffon



Carl Linnaeus

Classical Biogeography: Early Perspectives

- Center of origin theory, elevational/latitudinal gradients

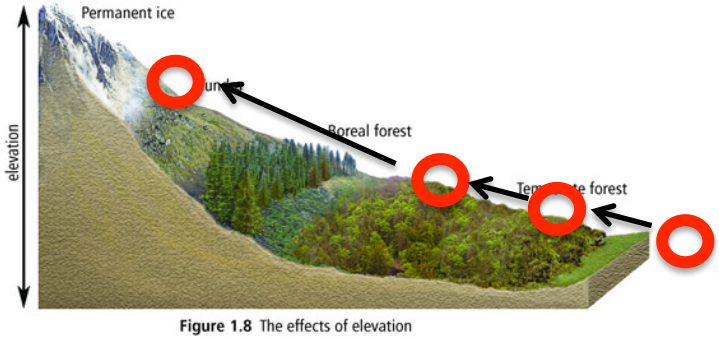
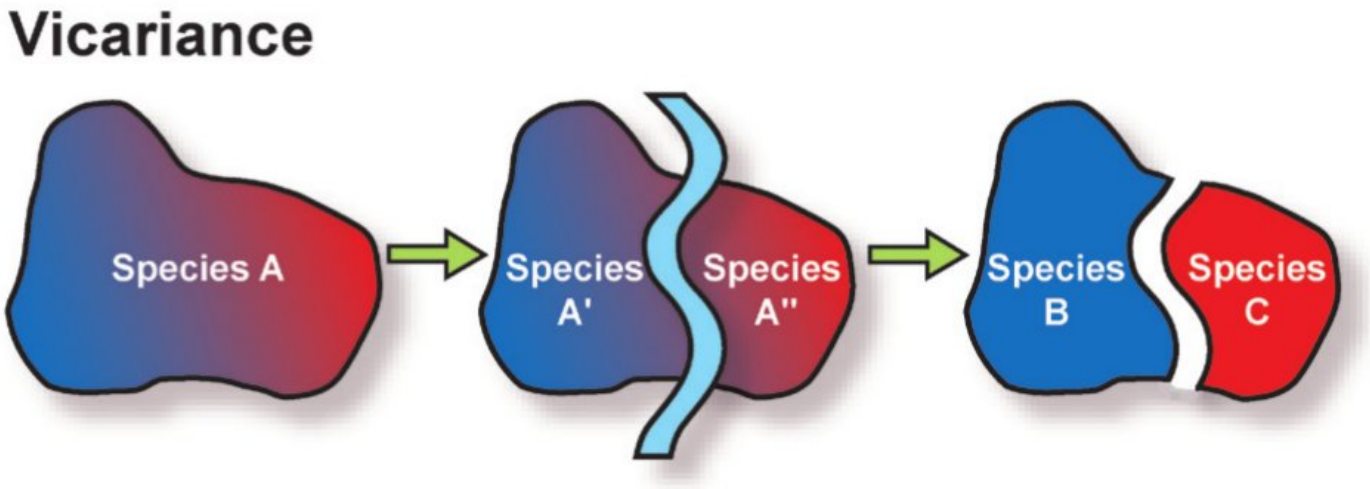


Figure 1.8 The effects of elevation

Compte de Buffon

Classical Biogeography: Early Perspectives

- Dynamic earth, dynamic species, vicariance




Alexander von Humboldt

Classical Biogeography: Early Perspectives

- Father of Phytogeography
- Carlos IV of Spain provided him permission to travel anywhere in the Spanish colonies in the new world in hopes of finding riches, Humboldt it seems never looked for them
- Best known for explorations in Central and South America
- Invented the isobar and isotherm

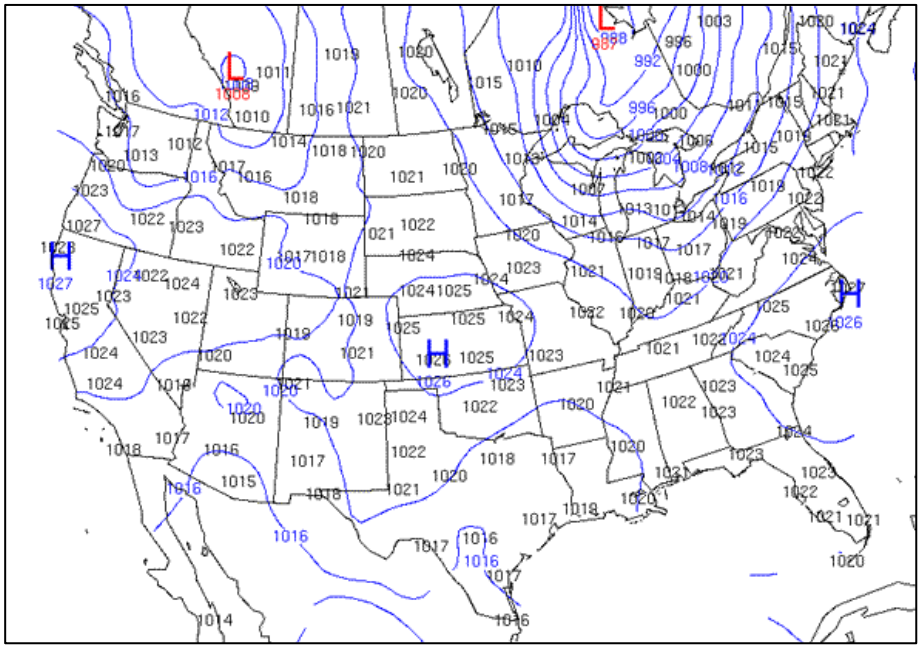
Alexander von Humboldt

Classical Biogeography: Early Perspectives

Isobars

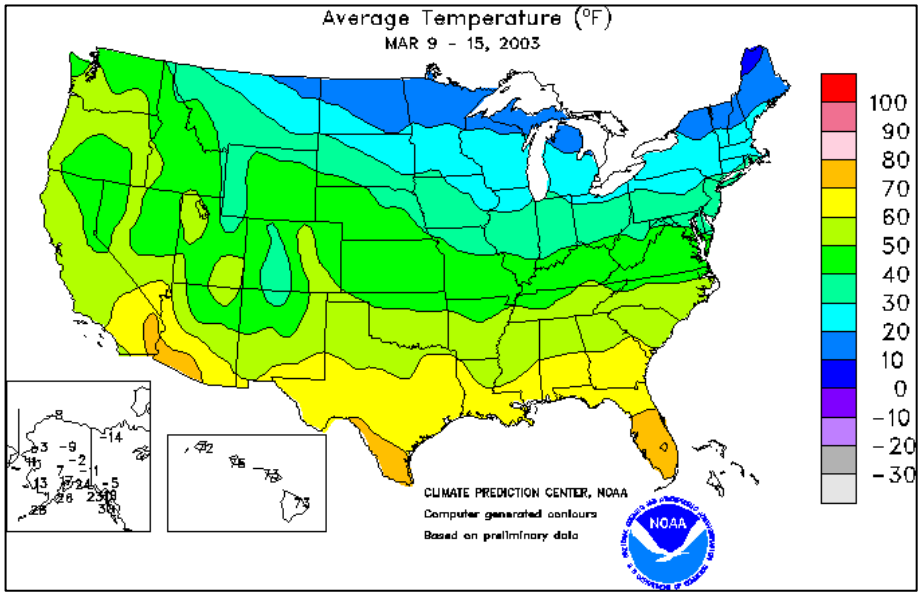
Isobar

Changes in Pressure



Isotherm

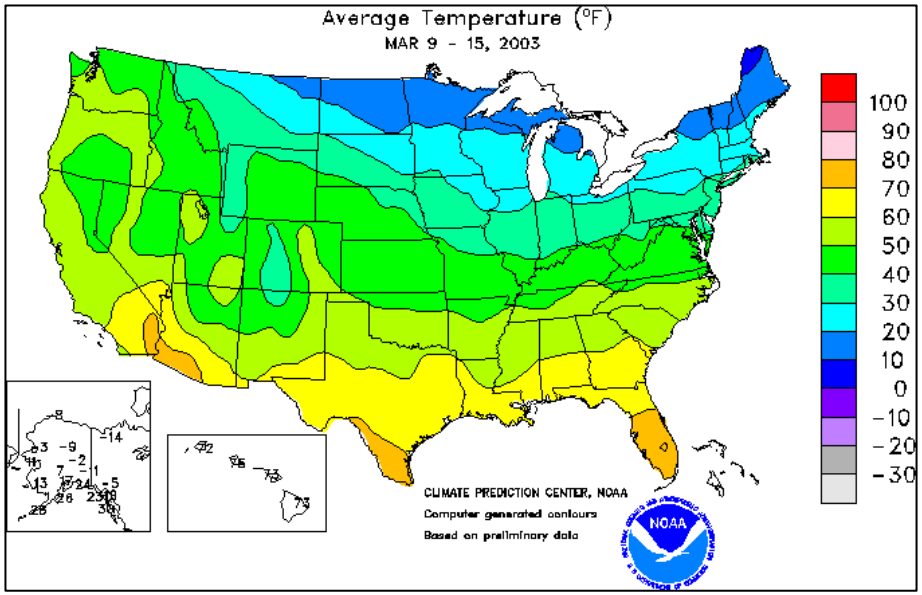
Changes in Temperature



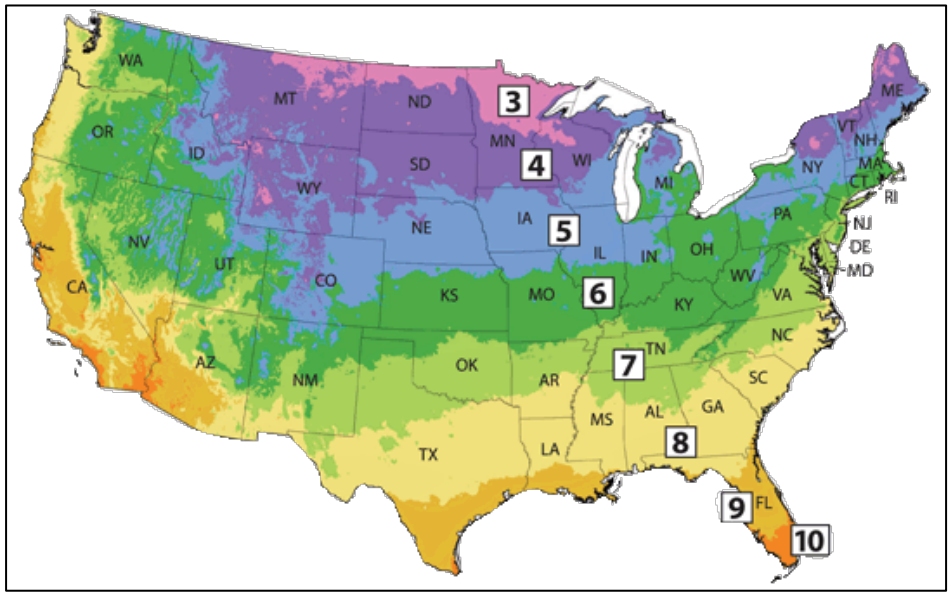
Alexander von Humboldt

Classical Biogeography: Early Perspectives

Isotherm
Mean Temperature



Plant Hardiness




Alexander von Humboldt

Classical Biogeography: Early Perspectives

- *Climb of Mt. Chimborazo*
- Thought to be the highest mountain in the world at the time
- Climbed 19,400 feet before descending, highest anyone had ever climbed
- Did this to study the different floristic belts

Alexander von Humboldt

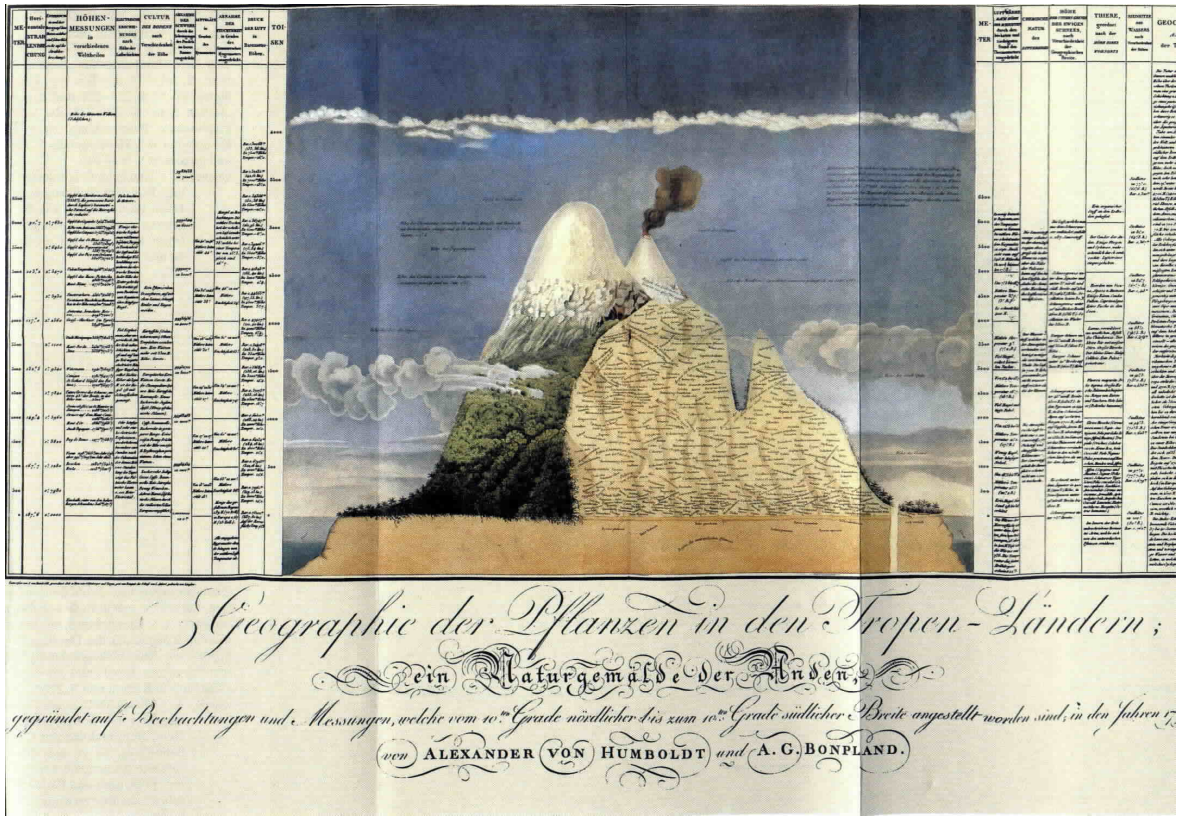
Classical Biogeography: Early Perspectives

- *Climb of Mt. Chimborazo*

Alexander von Humboldt

Classical Biogeography: Early Perspectives

- *Climb of Mt. Chimborazo*




Alexander von Humboldt

Classical Biogeography: Early Perspectives

- *Interesting Reads – posted on the website*

BOOKS OCTOBER 26, 2015 ISSUE

HUMBOLDT'S GIFT

He was once the most celebrated naturalist in the world. What happened to him?


By Elizabeth Kolbert

On September 14, 1869, the centenary of Alexander von Humboldt's birth was commemorated in New York—a city Humboldt had never visited—with a parade, a torchlight procession, a proclamation by the mayor, a formal banquet, and the unveiling of a bronze bust in Central Park. The following day, the *Times* devoted its entire front page to chronicling the festivities. The unveiling was scheduled for 2 P.M., but


Alexander von Humboldt

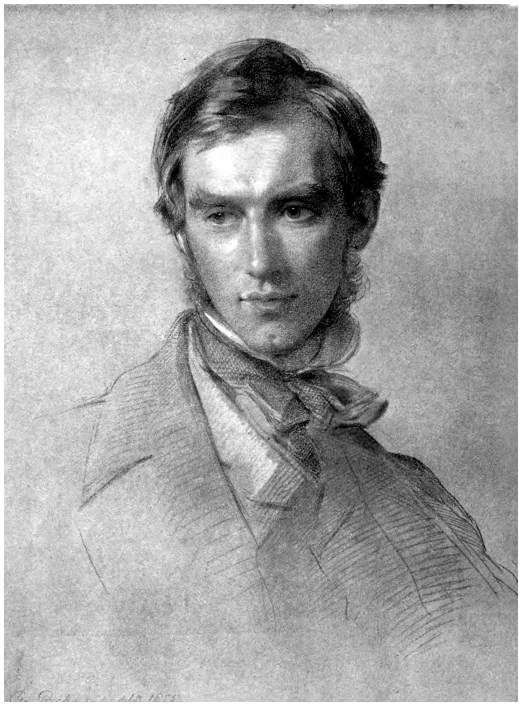
Classical Biogeography: Early Perspectives

- *Writings from his journeys motivated other scientists*

Charles Darwin

Alfred Wallace

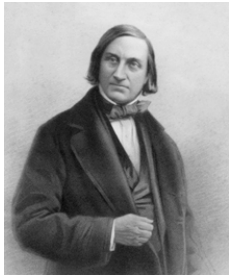
Joseph Dalton Hooker



Augustine de Candolle

Classical Biogeography: Early Perspectives

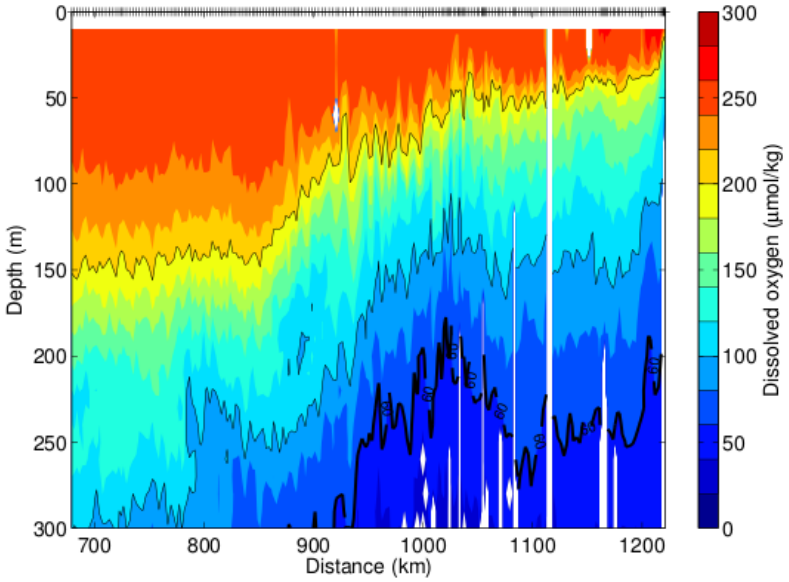
- *Close friend of Humboldt*
- *Attacked center of origin hypothesis*
- *Originated the idea of 'Nature's War', which stimulated Darwin's natural selection*
- *Observed physiological changes in plants throughout the day – pointed to the existence of the biological clock*

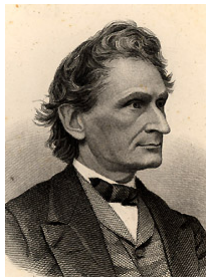


Edward Forbes

Classical Biogeography: Early Perspectives

- *Studied marine biota of the Mediterranean*
- *Changes in depth very much like changes in latitude*
- *Lifeless zone at depth*





James Dwight Dana

Classical Biogeography: Early Perspectives

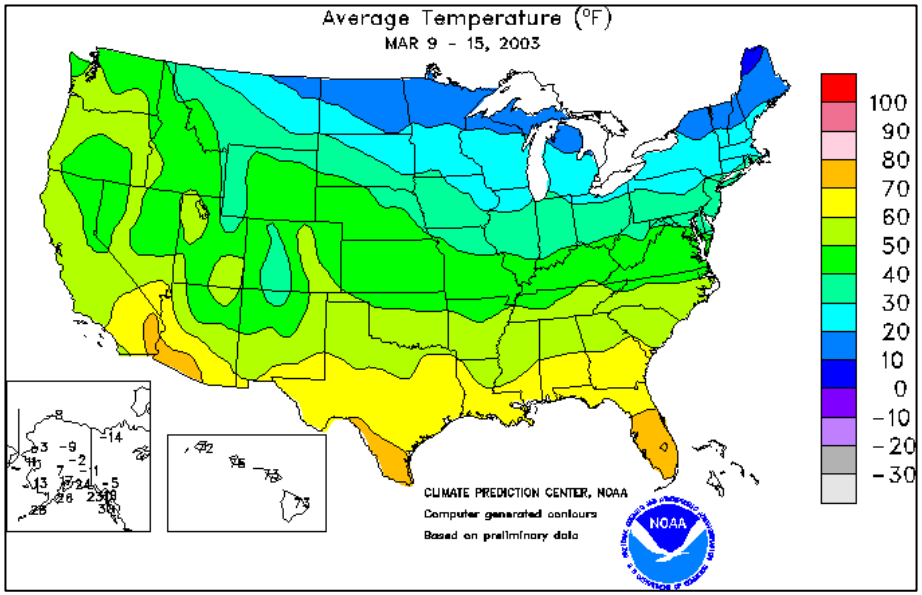
- *"The cause which limits the distribution of species northward or southward from the equator is the cold of winter rather than the heat of summer or the mean temperature of the year."*

- Eventually incorporated into 20th century explanations of the latitudinal diversity gradients of plants and animals

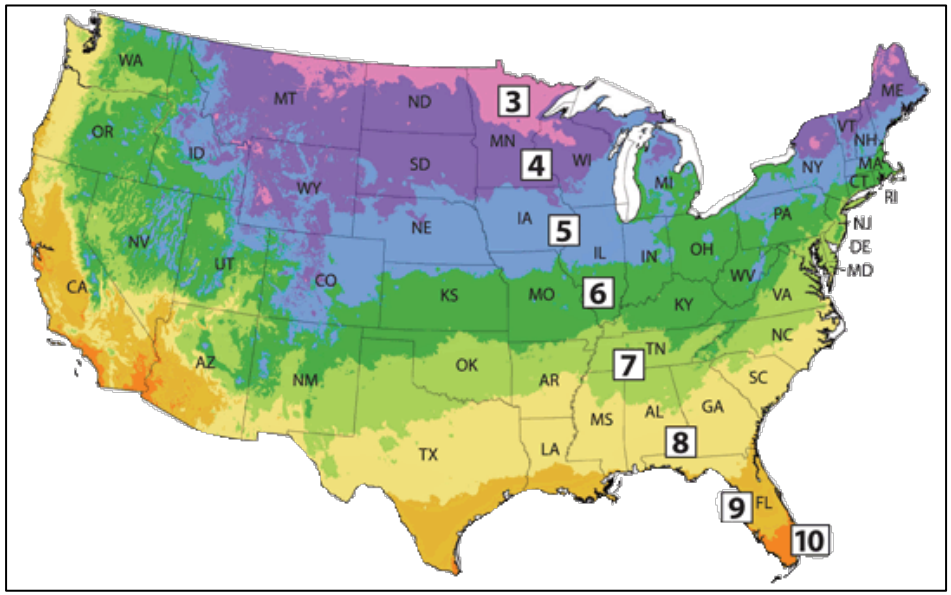
Alexander von Humboldt

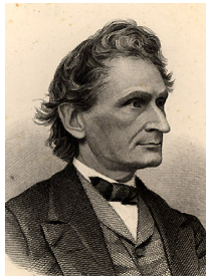
Classical Biogeography: Early Perspectives

Isotherm
Mean Temperature



Plant Hardiness

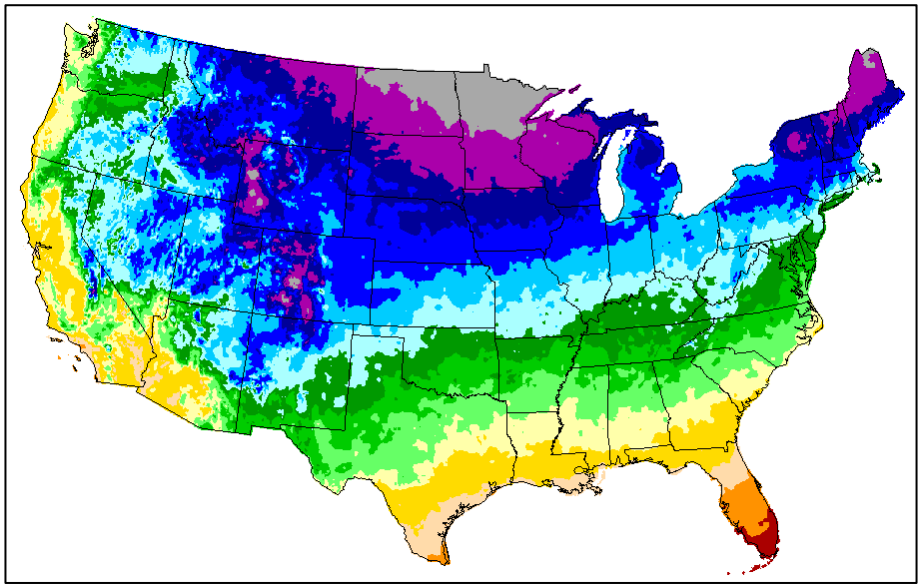




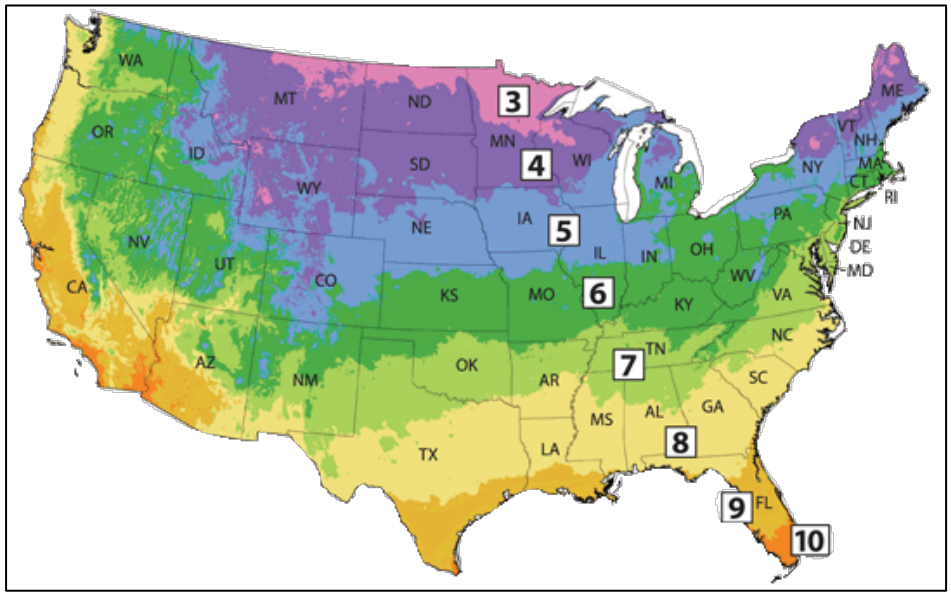
James Dwight Dana

Classical Biogeography: Early Perspectives

Isotherm
Min Temperature



Plant Hardiness




Alexander von Humboldt

Classical Biogeography: Early Perspectives

- *Essay of the Geography of Plants*
- Detailed analysis of physical environments and plant distributions
- Discusses not only these associations, but also ways of life, -or- habits

Alexander von Humboldt

Classical Biogeography: Early Perspectives

Sparse Habits

Dense Habits


Alexander von Humboldt

Classical Biogeography: Early Perspectives

Plant Associations

Boreal Forest

Tropical Forest


Alexander von Humboldt

Classical Biogeography: Early Perspectives

Plant Associations

High → **Low**

Boreal Forest — **Tropical Forest**

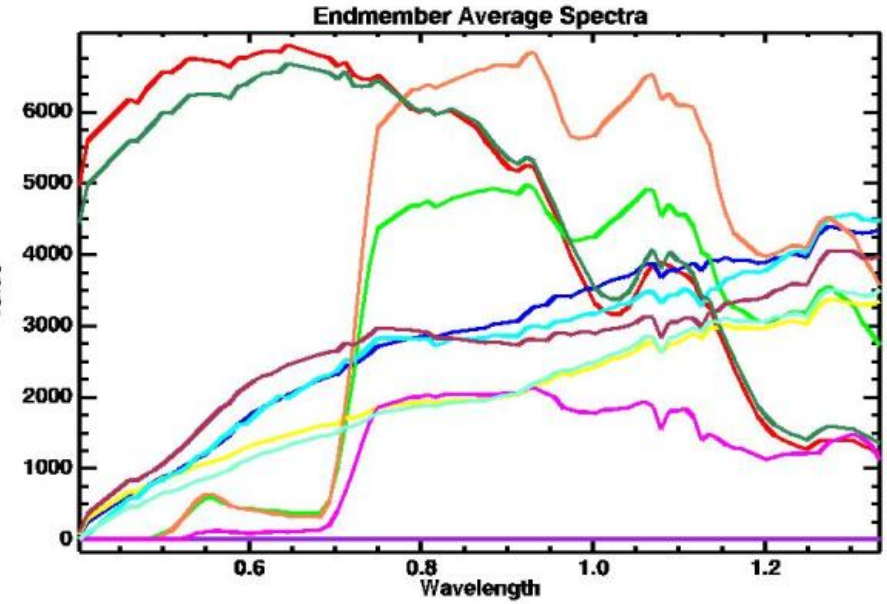
Greg Asner

Classical Biogeography: ~~Early~~ Current Perspectives

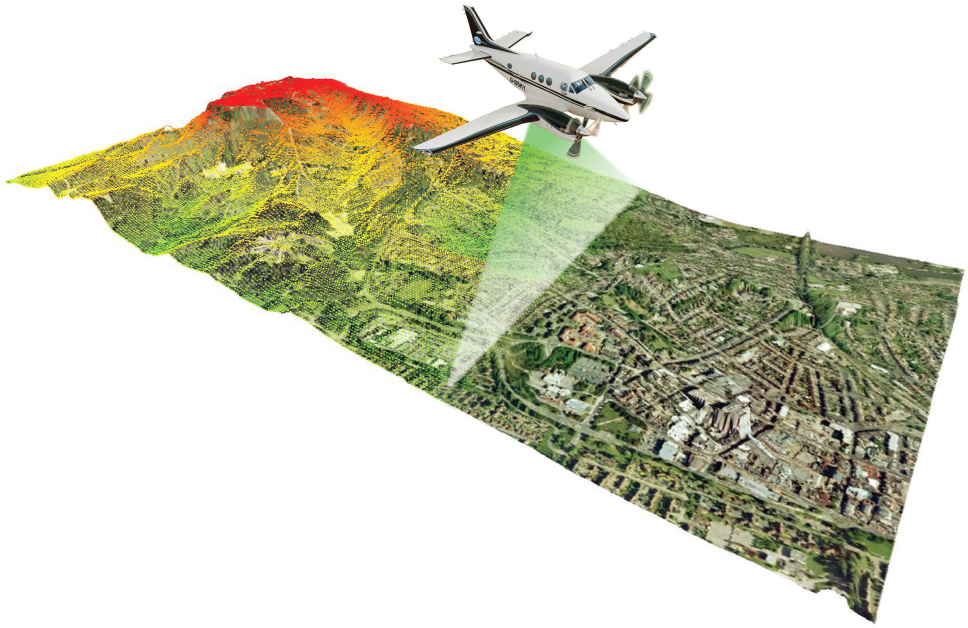
Greg Asner

Classical Biogeography: ~~Early~~ Current Perspectives

Hyperspectral Reflectance



Lidar



Greg Asner

Classical Biogeography: ~~Early~~ Current Perspectives

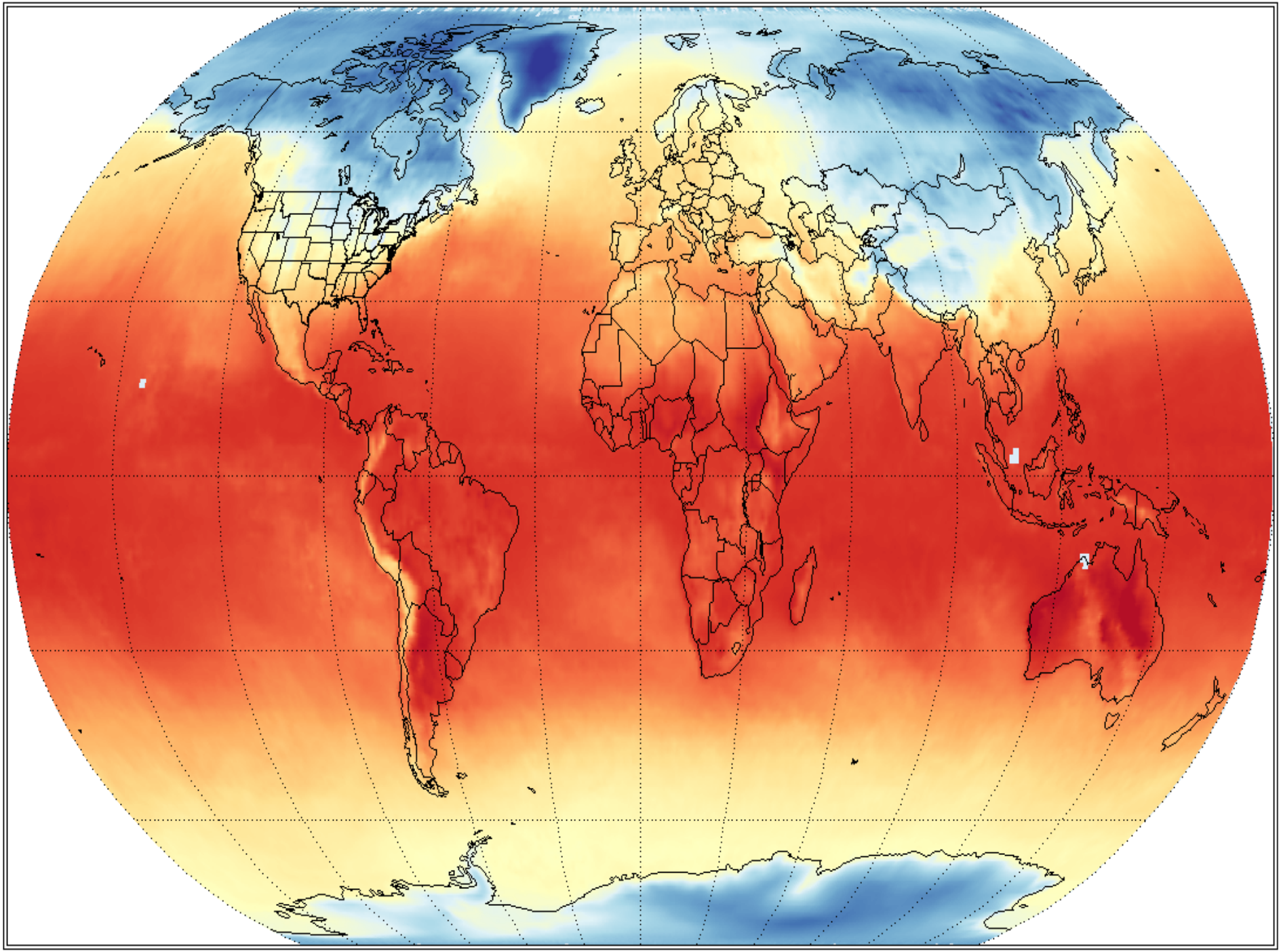
Visual

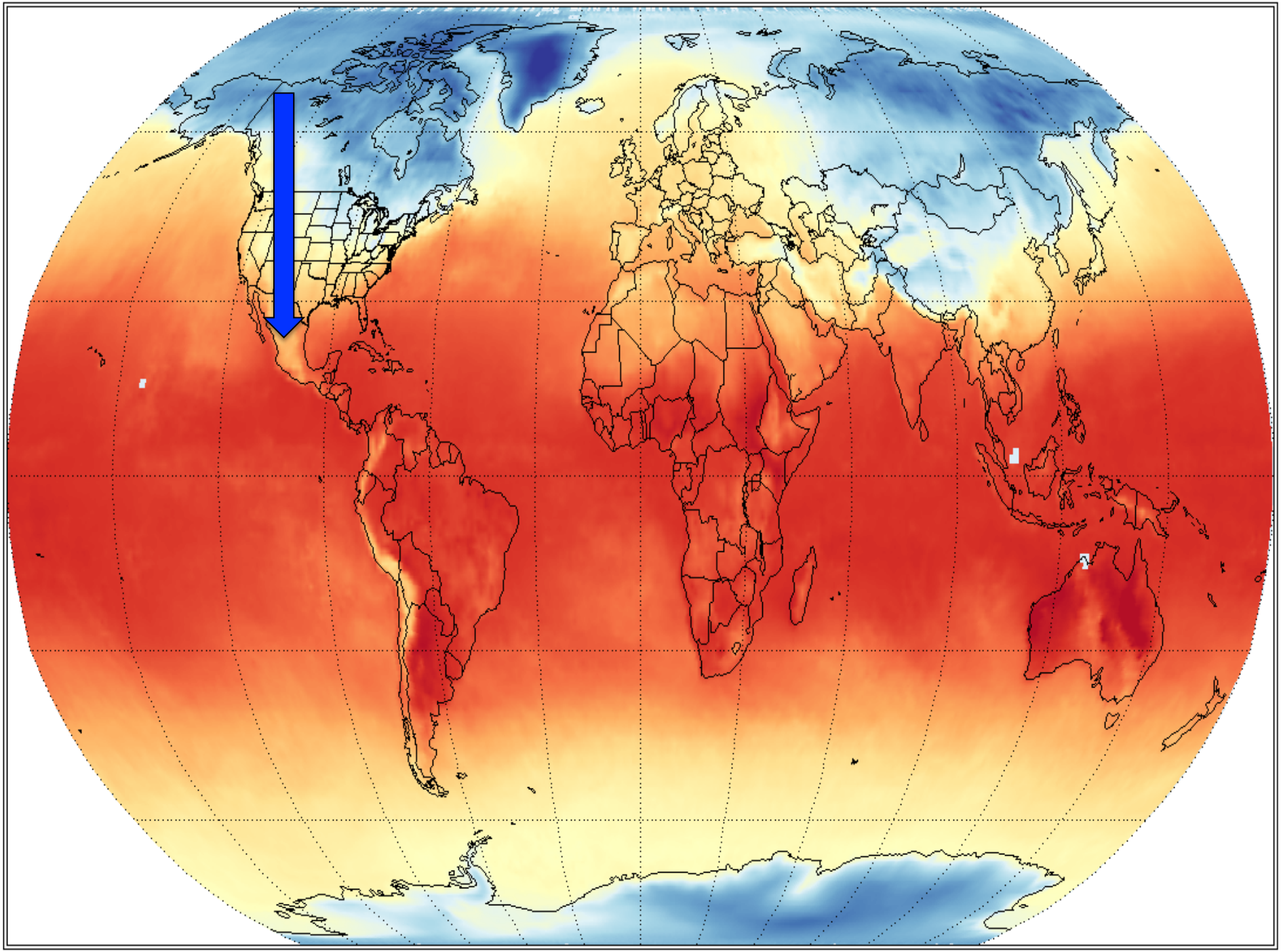
Species Determination from Hyperspectral Imagery

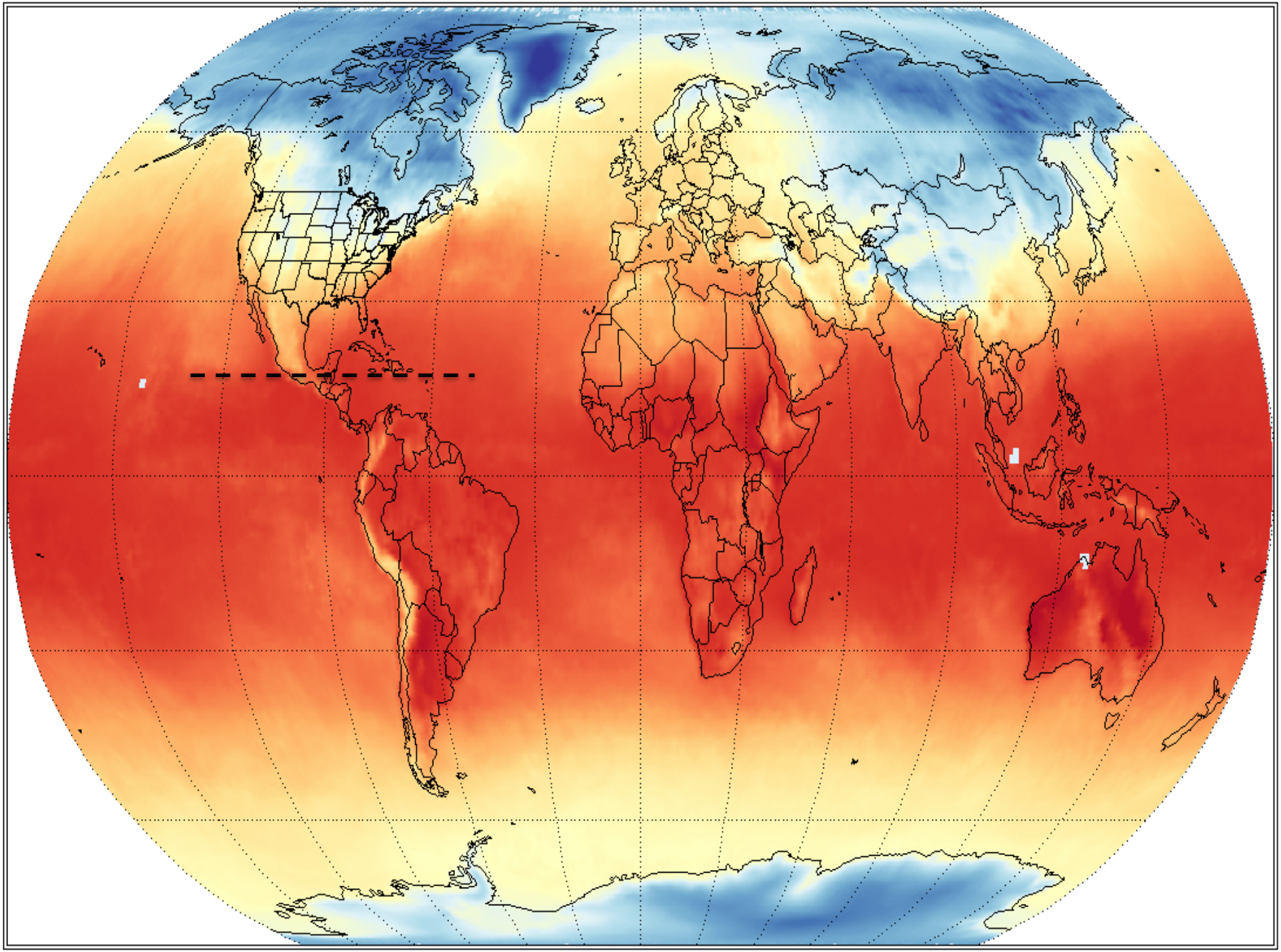

Alexander von Humboldt

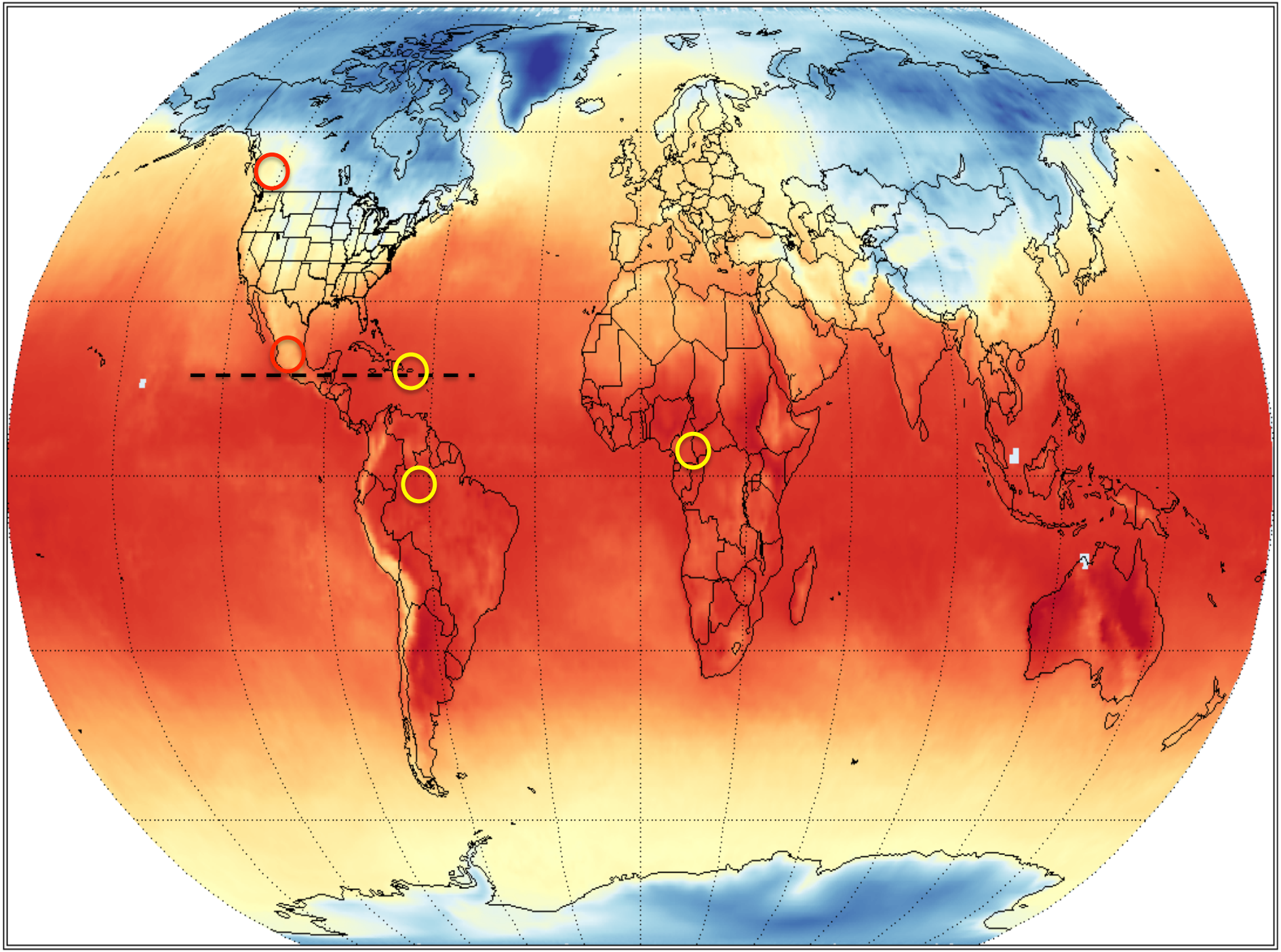
Classical Biogeography: Early Perspectives

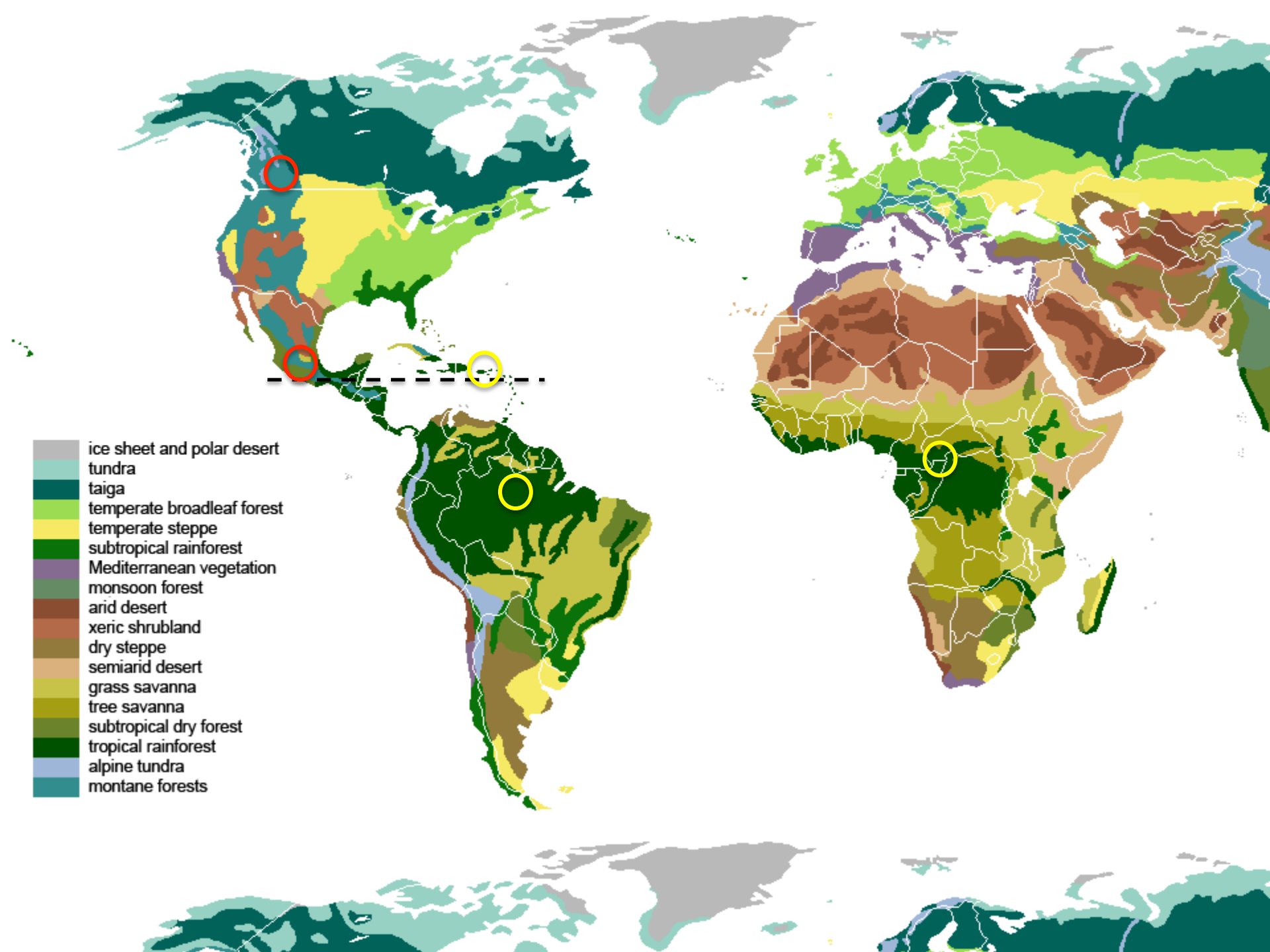
- Climatic control of plant associations
- Land mass continuous to north and allows for cooler climate to the south over land
- Not the case over water










ice sheet and polar desert
tundra
taiga
temperate broadleaf forest
temperate steppe
subtropical rainforest
Mediterranean vegetation
monsoon forest
arid desert
xeric shrubland
dry steppe
semiarid desert
grass savanna
tree savanna
subtropical dry forest
tropical rainforest
alpine tundra
montane forests


Alexander von Humboldt

Classical Biogeography: Early Perspectives

- First physical state of the Earth
- Did the Earth have an immediate diversity of plants?
- Species from one region that were transported to other regions?


Alexander von Humboldt

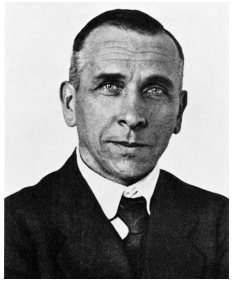
Classical Biogeography: Early Perspectives

- Dynamic climate
- Petrified fruits of palms, tree ferns, fossils of tapirs, crocodiles unearthed in Europe?
- Where these carries by ocean currents, or if these same areas once supported these plants and animals?


Alexander von Humboldt

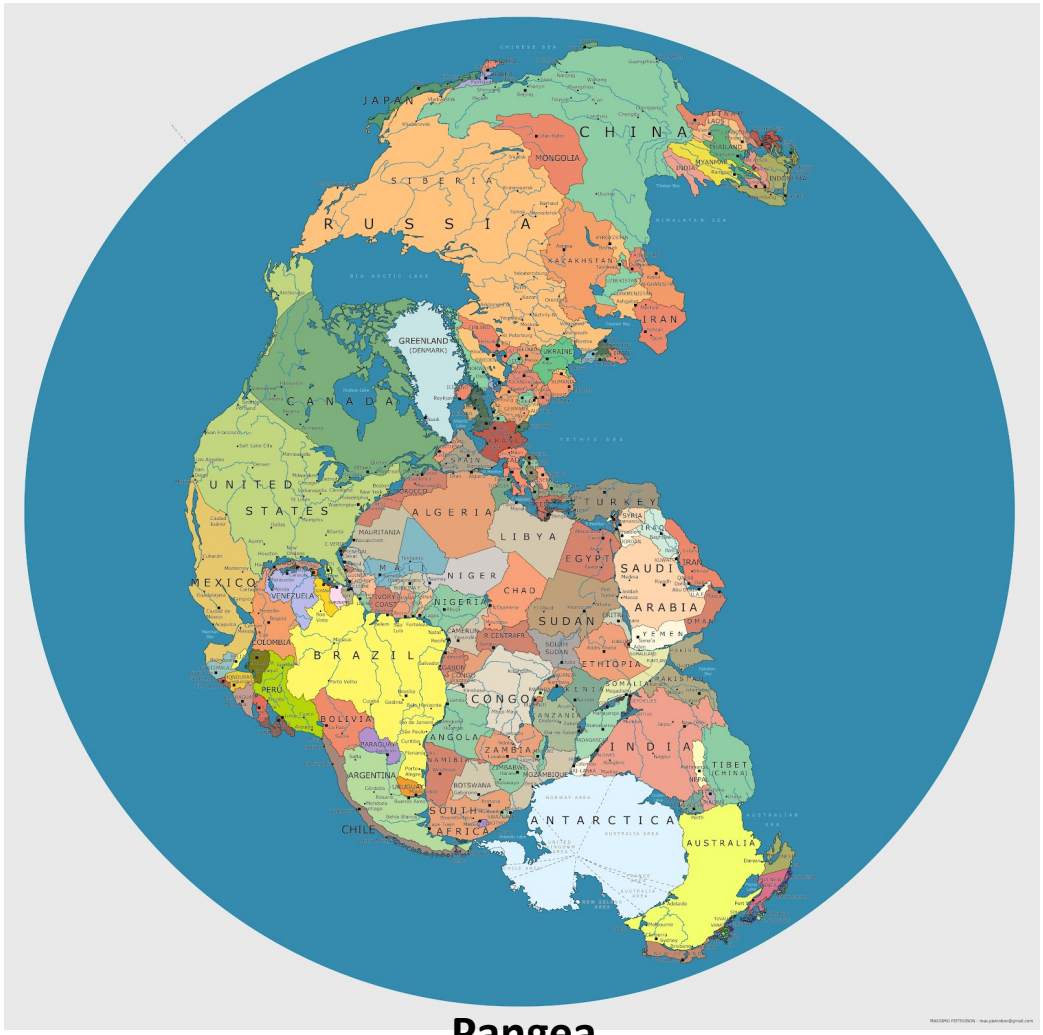
Classical Biogeography: Early Perspectives

- Dynamic climate
- Changes due to a shift of the stars and Earth axis -or- movement of continents?
- Actually a combination of both

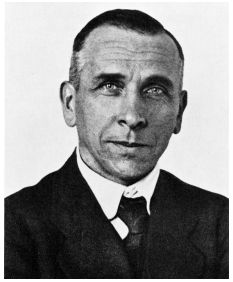


Alfred Wegener

Classical Biogeography: ~~Early~~ Recent Perspectives

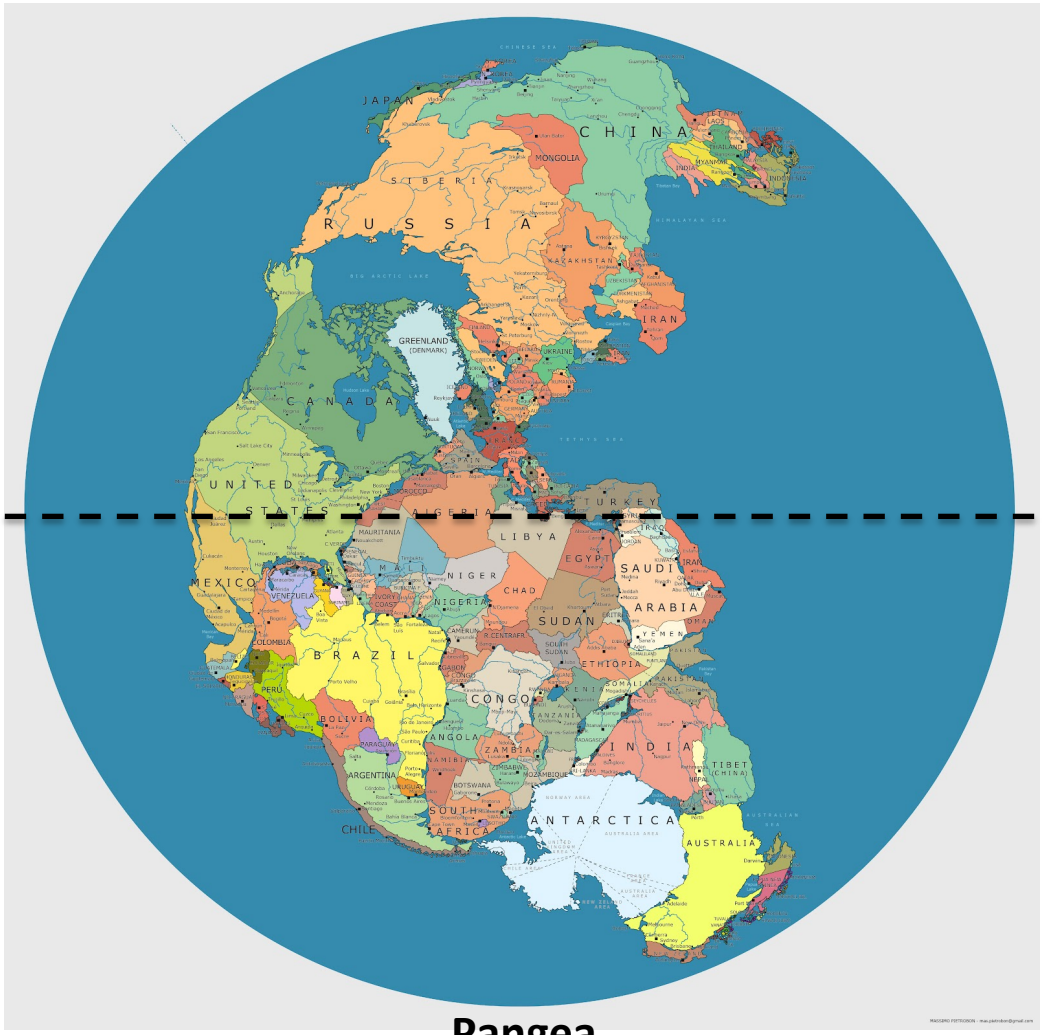


Pangea

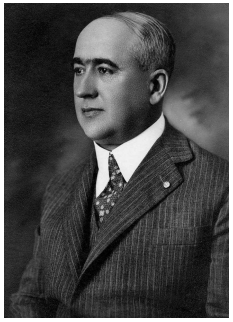


Alfred Wegener

Classical Biogeography: ~~Early~~ Recent Perspectives



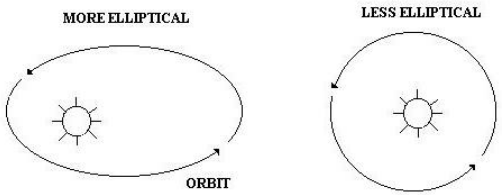
Pangea



Milutin Milanković

Classical Biogeography: ~~Early~~ Recent Perspectives

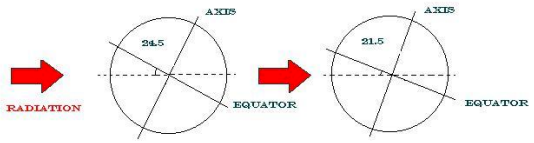
ECCENTRICITY



PERIODICITY:

100,000 YEARS

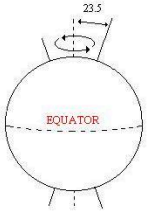
AXIAL TILT



PERIODICITY:

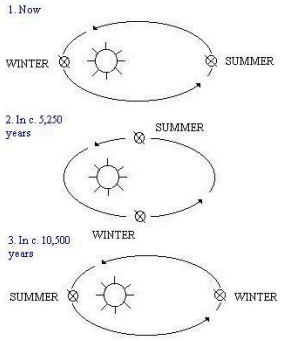
41,000 YEARS

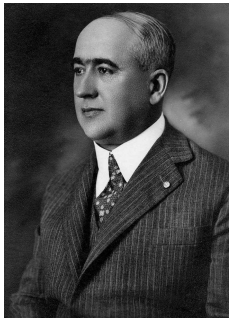
PRECESSION



PERIODICITY:

C. 23,000 YEARS

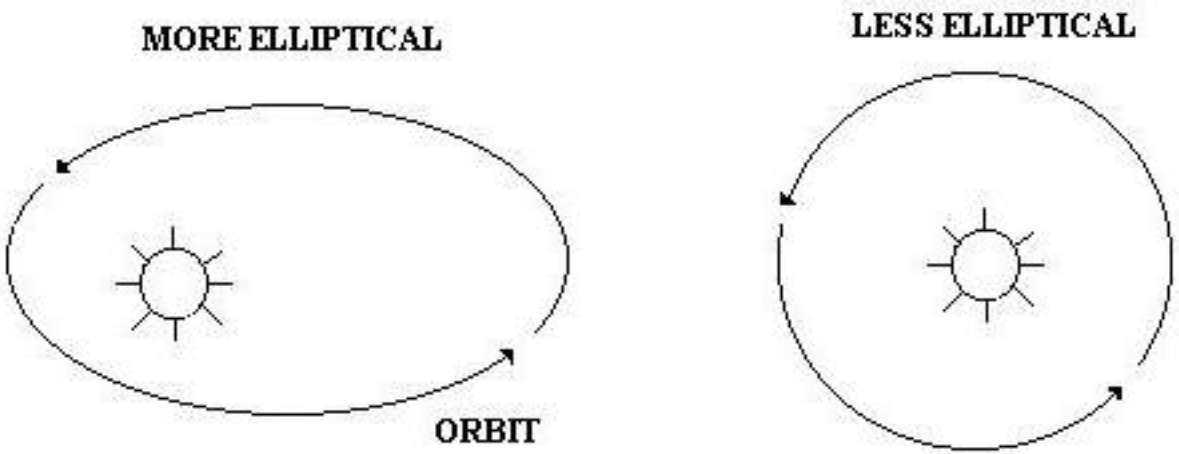




Milutin Milanković

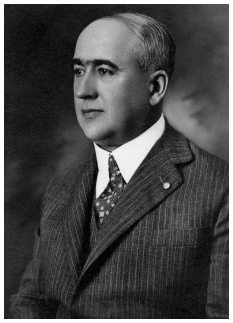
Classical Biogeography: ~~Early~~ Recent Perspectives

ECCENTRICITY



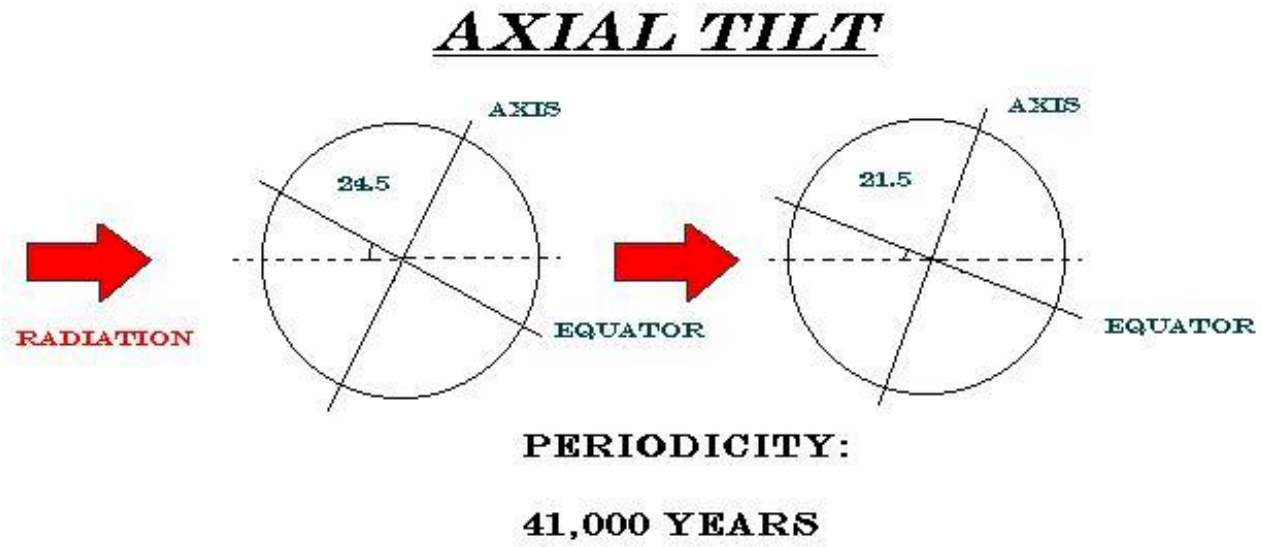
PERIODICITY:

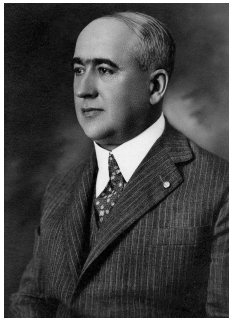
100,000 YEARS



Milutin
Milanković

Classical Biogeography: ~~Early~~ Recent Perspectives

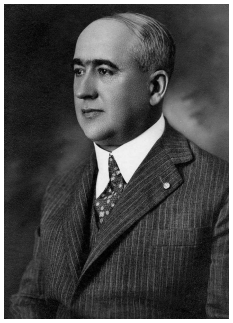




Milutin
Milanković

Classical Biogeography: ~~Early~~ Recent Perspectives

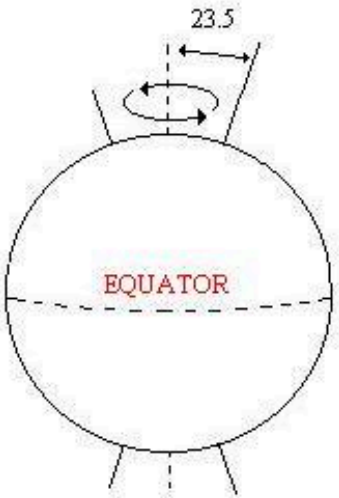
Axial Tilt



Milutin Milanković

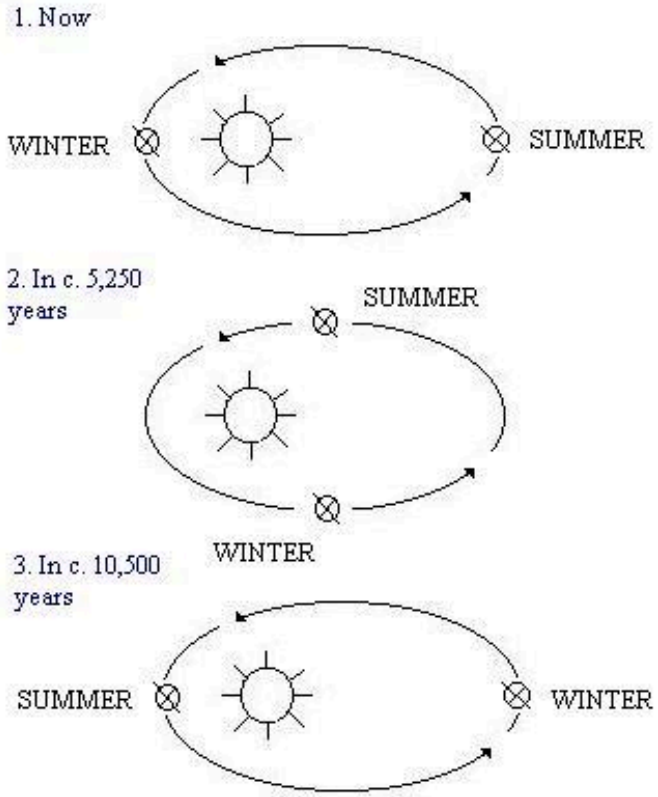
Classical Biogeography: ~~Early~~ Recent Perspectives

PRECESSION

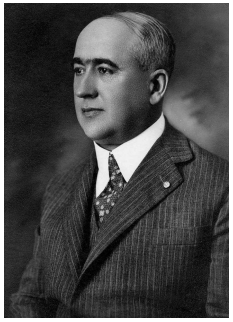


PERIODICITY:

C. 23,000 YEARS

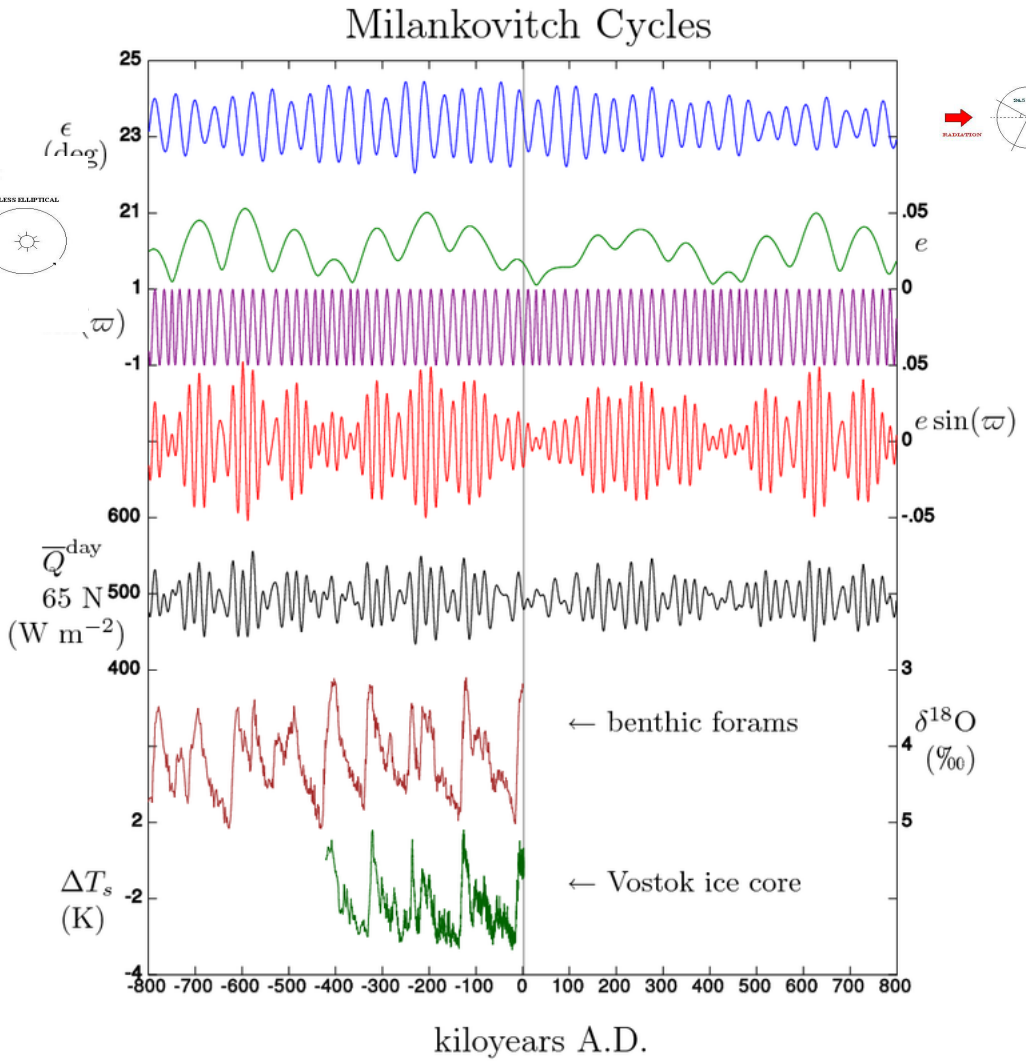


Stable Isotopes

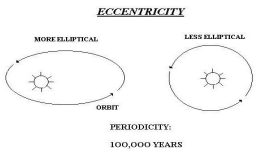


Milutin Milanković

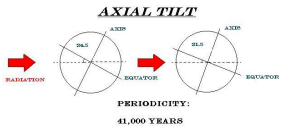
Classical Biogeography: ~~Early~~ Recent Perspectives



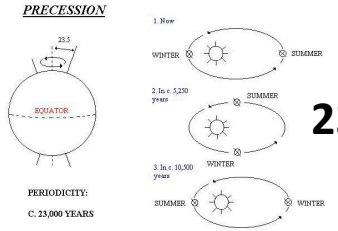
100K yr



41K yr



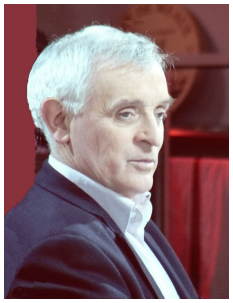
23K yr



Daily Insolation

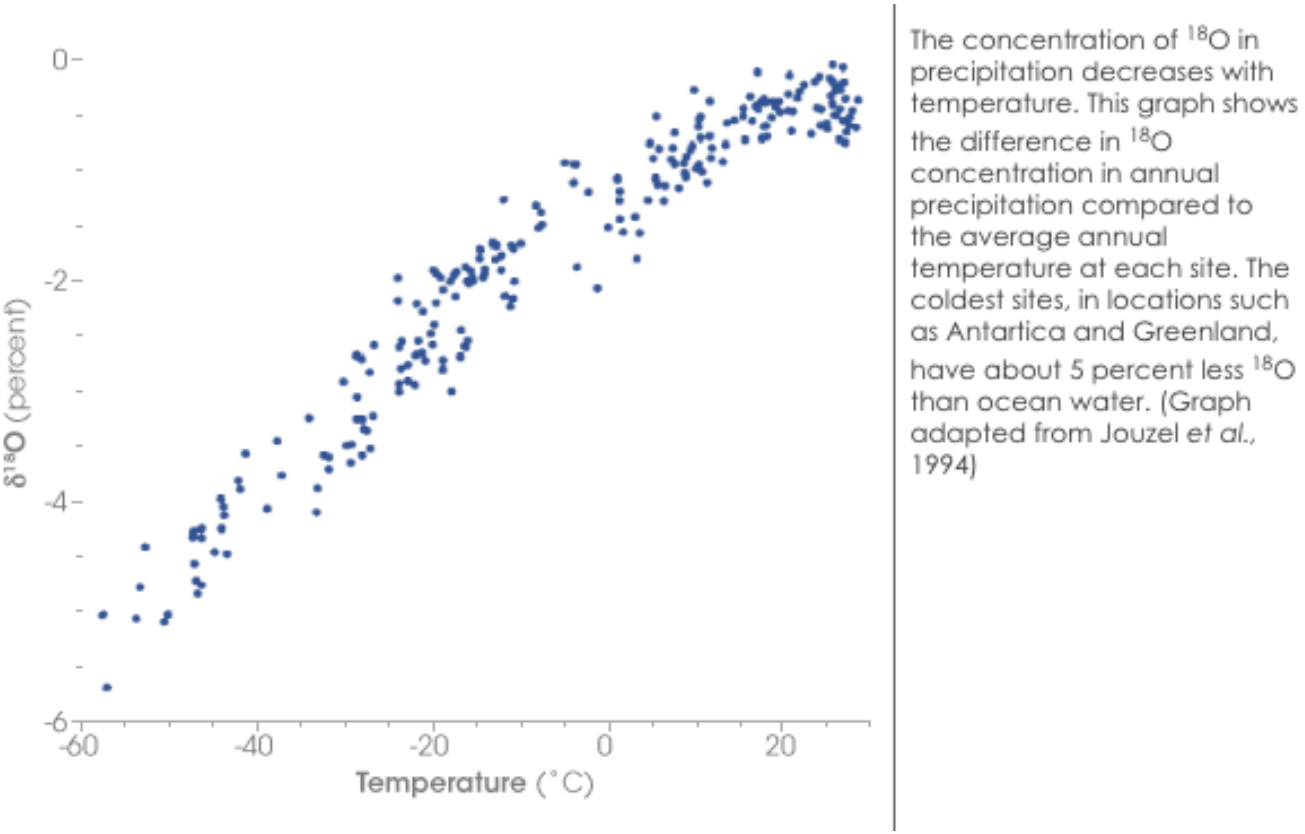
Delta ^{18}O

Temperature



Jean Jouzel

Classical Biogeography: ~~Early~~ Modern Perspectives



The concentration of ^{18}O in precipitation decreases with temperature. This graph shows the difference in ^{18}O concentration in annual precipitation compared to the average annual temperature at each site. The coldest sites, in locations such as Antartica and Greenland, have about 5 percent less ^{18}O than ocean water. (Graph adapted from Jouzel *et al.*, 1994)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Classical Biogeography: Early Perspectives

- Egyptian Ibis
- Mummified remains of ibis show that it has changed little from the times of Ancient Egypt
- Changes of plants and animals have occurred over time scales far longer than human tradition


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Classical Biogeography: Early Perspectives

Main Points

- Interplay of climate and plants
- Plant associations
- Dynamic climate
- Fixity of species versus dispersal and 'degeneration'
- Changes of plants and animals have occurred over time scales far longer than human tradition

Questions on the reading?


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Discussion Point 1

- "…never collected a European plant spontaneously produced by the southern American soil."

- "…risk falling into the same trap as geologists who construct the entire globe according to the model of hills which surround them."


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Discussion Point 1

- Are we at risk using only what we see around us to inform how the world works?
- Can you think of other examples from classes where people have made this mistake?
- Other examples from outside of class, recent news?

Discussion Point 1

2012 Presidential Election

- **Dick Morris**: "Prediction: Romney 325, Obama 213"
- **Glenn Beck**: "321-217 victory for Romney in the electoral college."
- **Rush Limbaugh**: "Everything -- Except the Polls -- Points to a Romney Landslide"
- **Michael Barone**: "Romney Beats Obama, Handily"
- **George Will**: Romney 321, Obama 217
- **Newsmax**: "Expect a Mitt Romney Landslide"
- **Larry Kudlow**: "I am now predicting a 330 vote electoral landslide."

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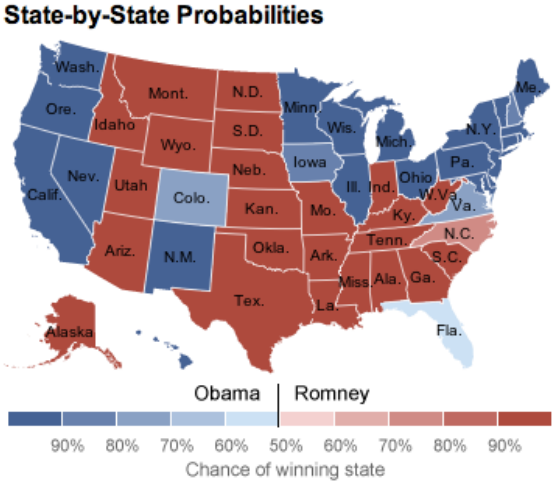
Discussion Point 1

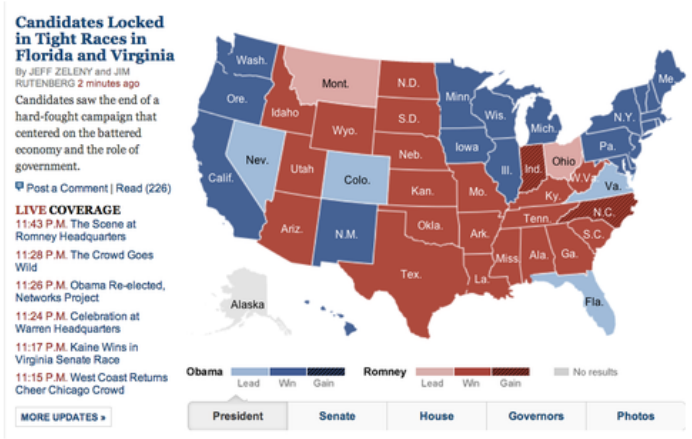
2012 Presidential Election

Numbers nerd Nate Silver's forecasts prove all right on election night

FiveThirtyEight blogger predicted the outcome in all 50 states, assuming Barack Obama's Florida victory is confirmed

Nate Silver designed a system to predict baseball performance, before turning his hand to politics. Photograph: David E Klutho/Sports Illustrated/Getty Images





Discussion Point 1

2016 Presidential Primary

POLLSTER	SAMPLE	WEIGHT	LEADER	DRUMPF	KASICH	CRUZ	RUBIO	CARSON	BUSH	CHRISTIE	FIORINA	SANTORUM	PAUL	HUCKABEE
JAN. 9-11 YouGov	552 LV	0.00	Trump +16	36%	3%	20%	11%	6%	5%	4%	3%	2%	3%	3%
JAN. 7-11 Ipsos, online	292 LV	0.00	Trump +23	42%	2%	19%	8%	10%	9%	3%	2%	1%	1%	3%
JAN. 10 Gravis Marketing	832 RV	0.00	Trump +21	41%	4%	20%	11%	5%	6%	3%	4%		2%	2%
JAN. 8-10 Morning Consult	878 RV	0.00	Trump +30	42%	2%	10%	9%	12%	5%	4%	1%	1%	3%	2%
JAN. 7-10 CBS News	442 LV	0.00	Trump +17	36%	2%	19%	12%	6%	6%	3%	3%		1%	4%
JAN. 6-10 Ipsos, online	296 LV	0.00	Trump +18	39%	2%	21%	10%	10%	7%	5%	3%	1%	0%	2%
JAN. 4-10 SurveyMonkey	2,852 RV	0.00	Trump +18	38%	2%	20%	11%	9%	3%	3%	2%	0%	3%	2%
JAN. 5-9 Ipsos, online	295 LV	0.00	Trump +18	40%	2%	22%	8%	12%	7%	4%	2%	0%	1%	2%
JAN. 4-8 IBD/TIPP	389 RV	0.00	Trump +16	34%	2%	18%	9%	8%	4%	4%	2%		3%	1%
JAN. 4-8 Ipsos, online	300 LV	0.00	Trump +16	39%	2%	23%	9%	13%	6%	3%	2%	0%	2%	2%
JAN. 4-7 Fox News	423 LV	0.00	Trump +15	35%	2%	20%	13%	10%	4%	2%	3%	0%	2%	1%
JAN. 3-7 Ipsos, online	337 LV	0.00	Trump +16	39%	2%	23%	10%	13%	6%	2%	1%	1%	2%	2%
JAN. 2-6 Ipsos, online	329 LV	0.00	Trump +13	36%	2%	23%	10%	12%	6%	4%	2%	1%	3%	2%
DEC. 31-JAN. 6 YouGov	469 LV	0.00	Trump +17	36%	4%	19%	13%	6%	4%	4%	3%	1%	5%	2%
JAN. 1-5 Ipsos, online	298 LV	0.00	Trump +16	38%	2%	22%	10%	12%	6%	2%	2%	1%	3%	3%
DEC. 31-JAN. 4 Ipsos, online	253 LV	0.00	Trump +17	38%	2%	21%	11%	12%	6%	2%	2%	1%	3%	2%
DEC. 30-JAN. 3 Ipsos, online	176 LV	0.00	Trump +21	41%	2%	20%	10%	10%	3%	3%	4%	1%	2%	3%
DEC. 28-JAN. 3 SurveyMonkey	949 RV	0.00	Trump +17	35%	2%	18%	13%	9%	6%	4%	3%	1%	2%	2%


Alexander von Humboldt

Discussion Point 2

- How did Humboldt relate humans to the spread of plants?


Alexander von Humboldt

Discussion Point 2

- “The variety of produce becomes all more interesting when it recalls to the observer’s imagination the series of events which spread the human race across the whole surface of the globe, and of which it appropriated all the produce.”


Alexander von Humboldt

Discussion Point 2

- Using plants to trace human origins
- Economic plants, where did they come from, fruit trees, grains
- How can this trace the movement of people?

Alexander von Humboldt

Discussion Point 2