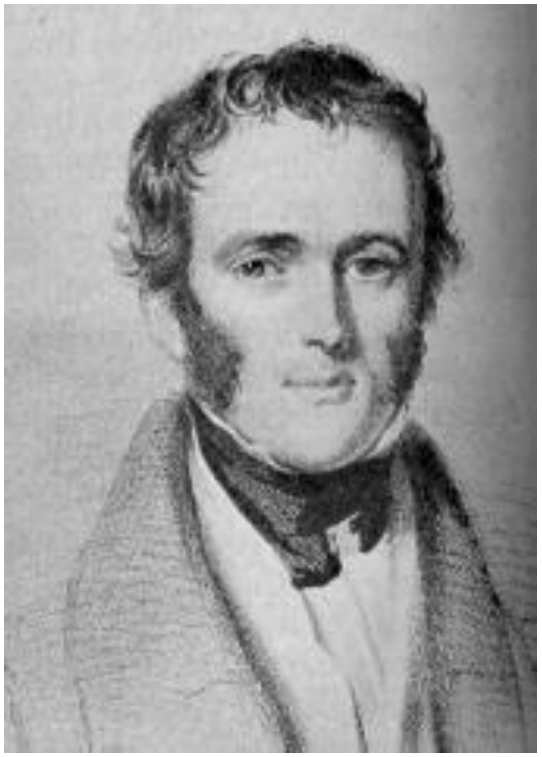
Charles Lyell's *Principles of Geology*

Evolution &
His Thought Experiments on
Extinction and Replacement



Charles Lyell (1797-1875)

Geological Theories of the 18th-19th centuries

	Uniformitarianism	**Catastrophism**
Neptunism		Abraham Gottlob Werner Robert Jamison William Buckland
Volcanism		Georges Cuvier
Various forces of flood, erosion, earthquake, volcanic activity, wind, etc.	James Hutton John Playfair Lamarck Charles Lyell	

Arguments for Lamarck

1. (Great variability of domestic animals)
2. As more organisms discovered, a smooth transition observed.
3. Characteristics newly acquired can be transmitted.
4. Some hybrids breed true.
5. Paleontological Record shows progression, as we assume in human progress in reason.
6. Changes in fossils coordinated with changes in rocks.

After giving his case for Lamarck and noting the enthusiasm of the hypothetical reader of the Frenchman:

“Henceforth his speculations know no definite bounds; he gives the rein to conjecture, and faces that the outward from, internal structure, instinctive faculties, nay, that reason itself, may have been gradually developed from some of the simplest states of existence,--that all animals, that man himself, and the irrational beings, may have had one common origin; that all maybe parts of one continuous and progressive scheme of development from the most imperfect to the more complex; in fine, he renounces his belief in the high genealogy of his species, and looks forward, as if in compensation, to the future perfectibility of man in his physical, intellectual, and moral attributions.

Let us now proceed to consider what is defective in evidence, and what fallacious in reasoning, in the grounds of these strange conclusions…. In each case we must be guided by analogy and probability.”

Lyell, Principles of Geology, ch 2, pp. 20-21

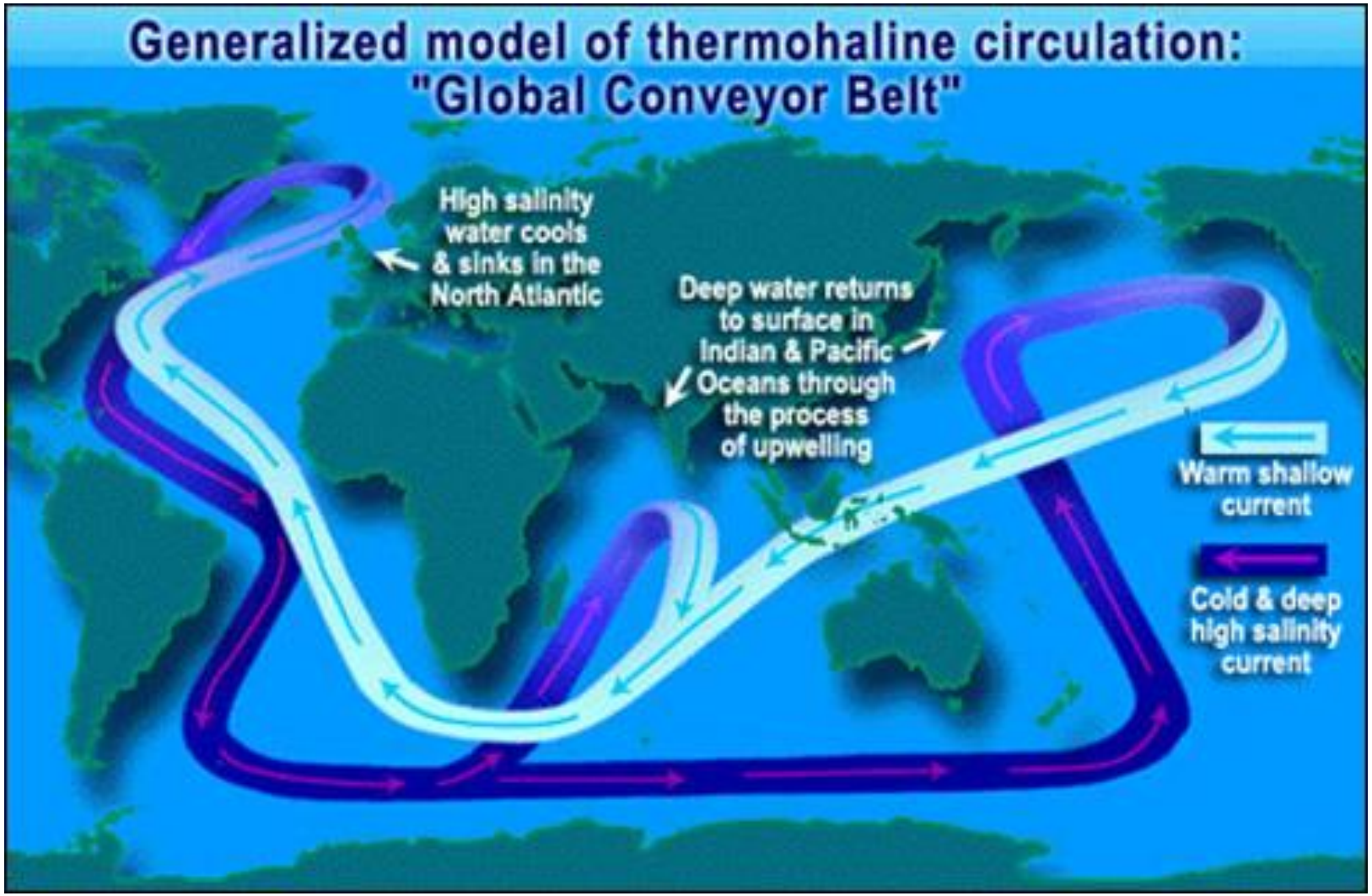
Arguments against Lamarck

Must examine the reasoning and evidence, relying on the probabilities.

1. The gaps between species often filled by damaged and partial species specimens.
2. We can make fine distinctions between organisms in a series.
3. “Now if we assume, for the present, these rules hypothetically, let us see what consequences may naturally be expected to result.” Consider the situation if the rule of orthodox biology are followed out:
    a. External causes can modify organisms, producing varieties.
    b. The modifications transmissible.
    c. Fixed limits of deviation.
    d. Each species from one original stock
    e. Each species will endure for a limited time.
    f. Thus these rules cover what we know of species.

4. In domestic breeds, breeders chose animals for their variability.
    a. Cuvier shows that though dogs differ in size and morphology, their archetypal structure remains the same.
    b. Wild dogs do not revert to wolf, from which they supposedly came.
5. Mummified animals that Napoleon's scientists brought back from Egypt show that no real change in 3000 years.
6. Species change runs up against limits of variation.
7. Domesticated plants will revert without the hand of man.

Panama could subside a few hundred feet, and great changes would be wrought in sea life, as Pacific and Caribbean forms would mix.

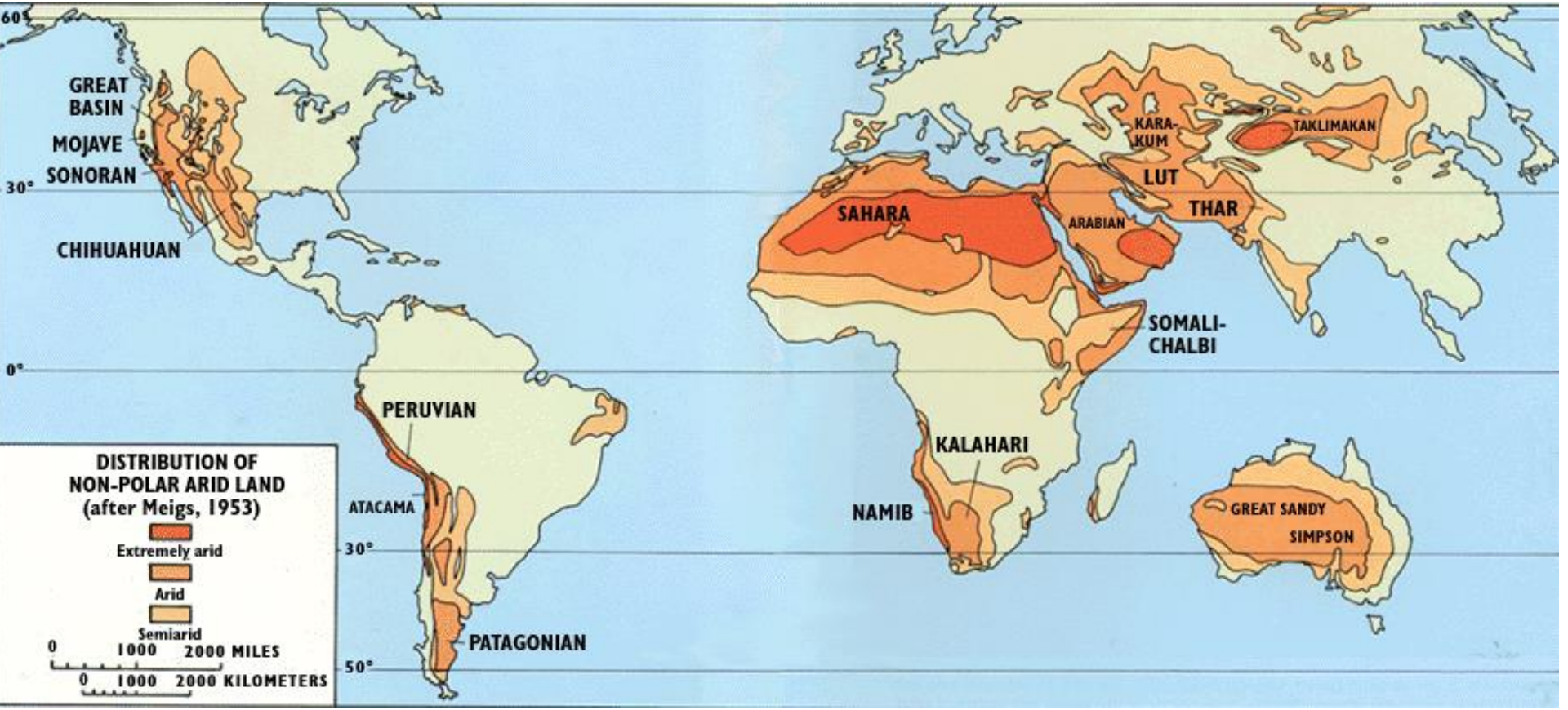

Generalized model of thermohaline circulation:
"Global Conveyor Belt"
High salinity water cools & sinks in the North Atlantic
Deep water returns to surface in Indian & Pacific Oceans through the process of upwelling
Warm shallow current
Cold & deep high salinity current

If area around Azof Sea were to subside, then Black Sea and Mediterranean Sea would pour into area of Caspian Sea, which is 50 to 300 feet below level of Black Sea. The floods would continue on to the Aral Sea.

Straits of Gibraltar, with Spain above and Morocco below.

Isthmus of Sleswick (i.e., Schlesweg), which separates North Sea from Baltic Sea—if that isthmus gradually gives way, salt water from the North Sea will pour into Baltic and change aquatic life

Opening at Staveren, joining the North sea and what was an inland lake, now separating North Holland from Friesland



As the Sarah spread, many species must have gone extinct. Alternatively, if volcanoes rise up in the dessert, and snows capping them, more water would be available in summer for plants and animals.