Zoogeography

PROF. CHIARA MANFRIN – CMANFRIN@UNITS.IT

Lessons schedule (room 1A, building Q)

OCTOBER

4.10.2022, h 8:00-10:00 TODAY

7.10.2022 , h 8:00-11:00

11.10.2022, h 8:00-10:00

14.10.2022, h 8:00-11:00

18.10.2022, h 8:00-10:00

21.10.2022, h 8:00-11:00

25.10.2022, h 8:00-10:00

28.10.2022, h 8:00-11:00

NOVEMBER

8.11.2022, h 8:00-10:00

11.11.2022 , h 8:00-11:00

15.11.2022, h 8:00-10:00

18.11.2022 , h 8:00-11:00

22.11.2022, h 8:00-10:00

25.11.2022 , h 8:00-11:00

29.11.2022, h 8:00-10:00

DECEMBER

2.12.2022 , h 8:00-11:00

6.12.2022, h 8:00-10:00

13.12.2022 , h 8:00-10:00

16.12.2022, h 8:00-11:00

20.12.2022 , h 8:00-10:00

Course organisation

MAIN TOPICS

Lessons from the Past

The challenge of existing

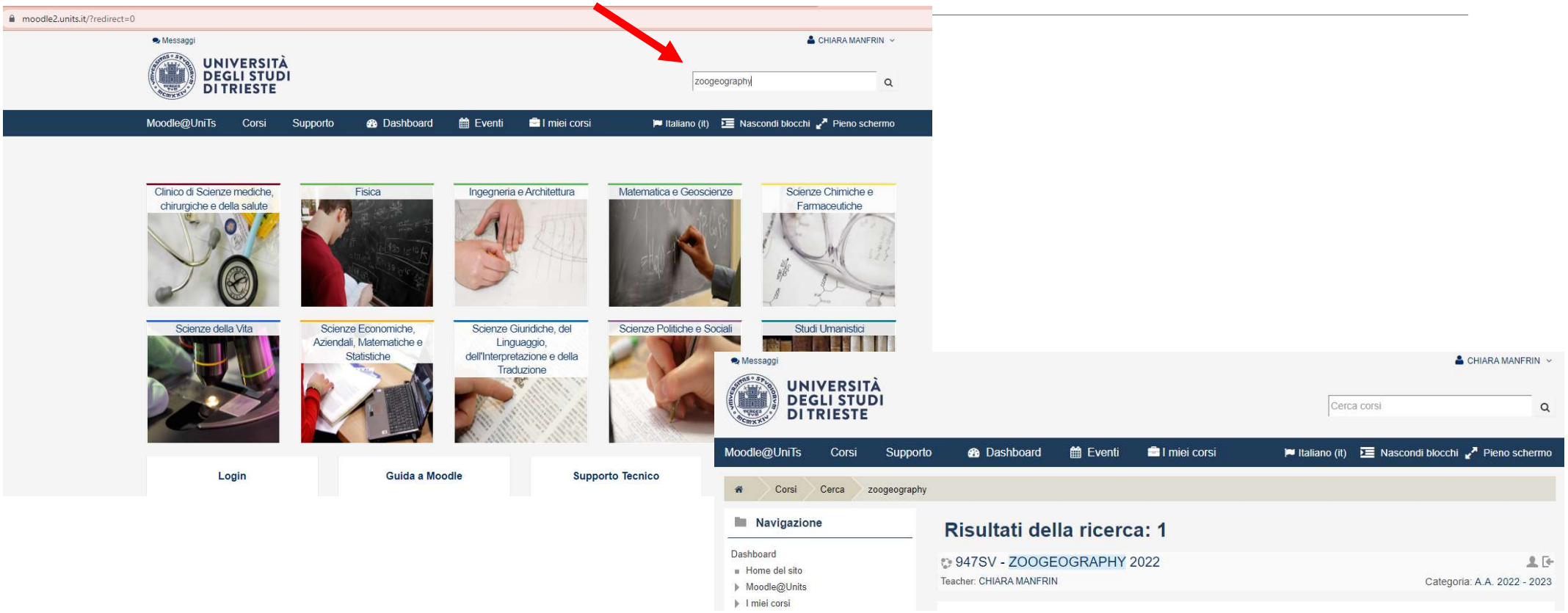
The Fauna of Islands

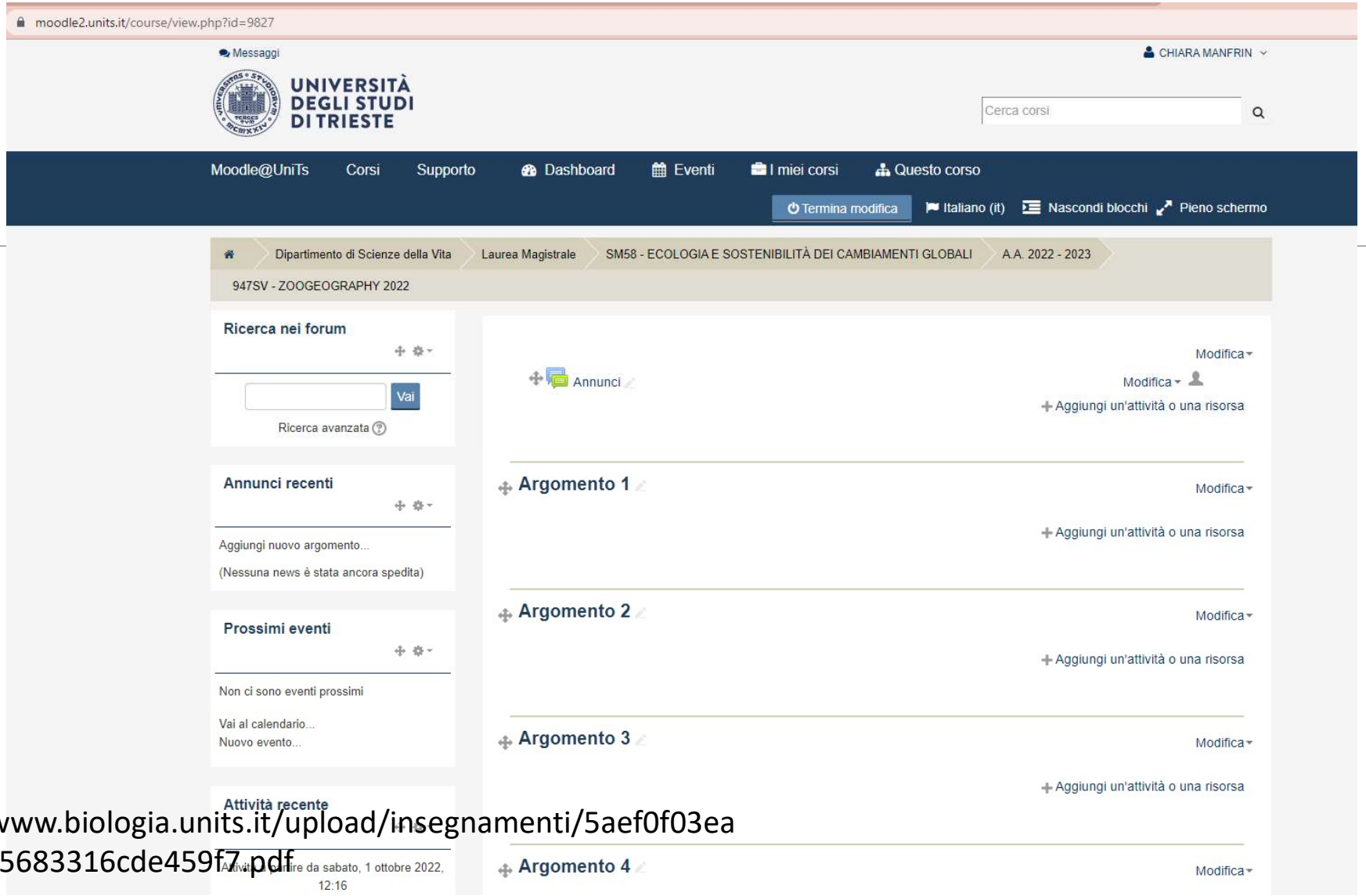
Patterns of Life

Conservation Zoogeography

See the specific Syllabus

Course organisation

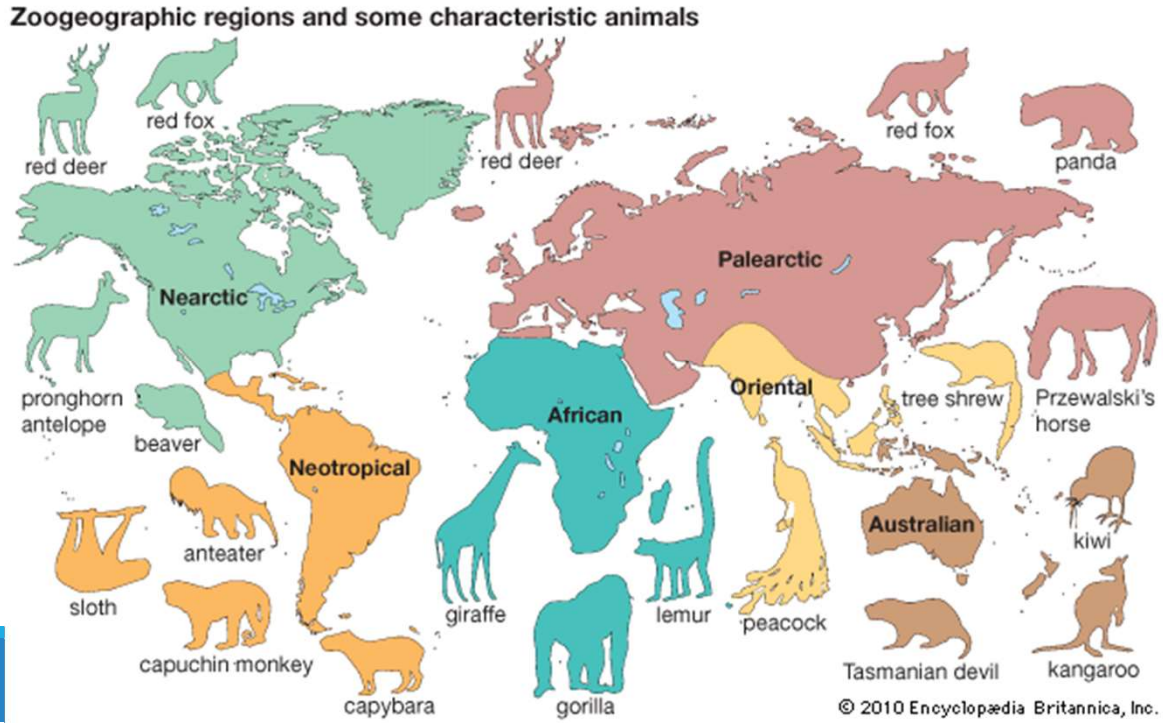


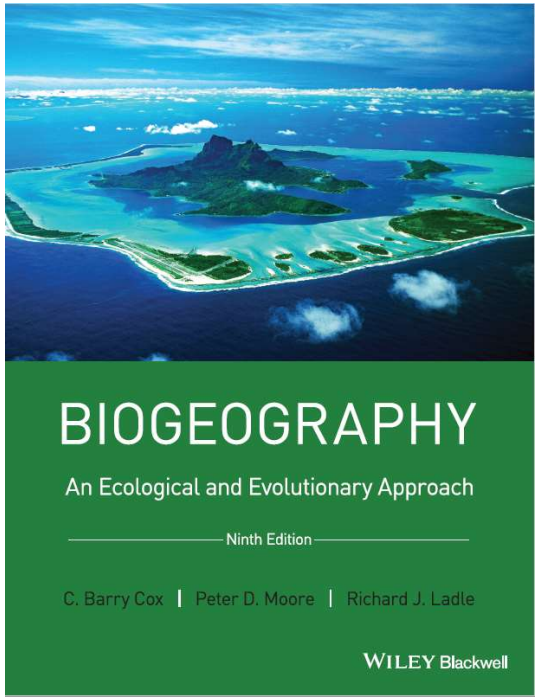


https://www.biologia.units.it/upload/insegnamenti/5aef0f03eac2b83745683316cde459f7.pdf

What's Zoogeography?

Study of the distribution, and of the **patterns of distribution**, of living organisms at all levels, **ranging from genes to whole organisms and biomes**, and of the **evolution** of these.





Zoogeography (and phyto as well) is a meeting point between **Biological sciences** and **Earth sciences**.

Lack of progress in one area has held back the other.

Temptation for workers in one field to accept, uncritically and without proper understanding, new ideas in the other field that seem to provide a solution.

Lack of progress in one area has held back the other

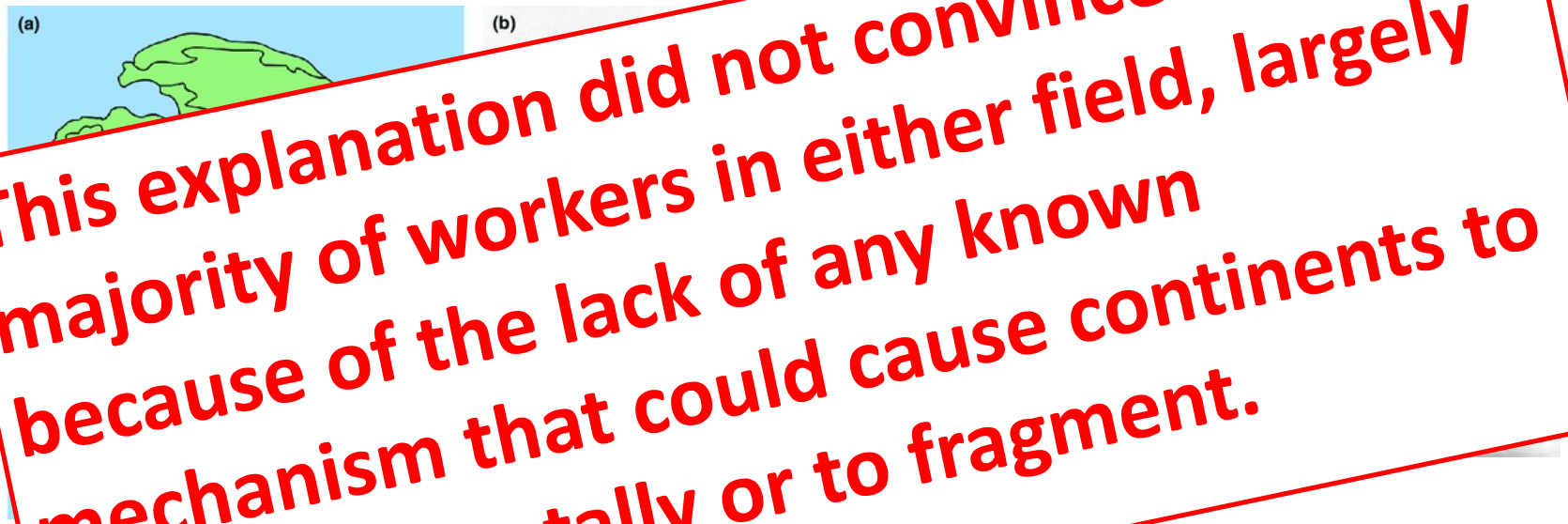
Continental drift theory (1912)

German meteorologist **Alfred Wegener** hypothesized that the continents once formed part of a single landmass called supercontinent (Pangea)

Plate tectonics is the theory that Earth's land masses are in constant motion

Continental drift theory (1912)

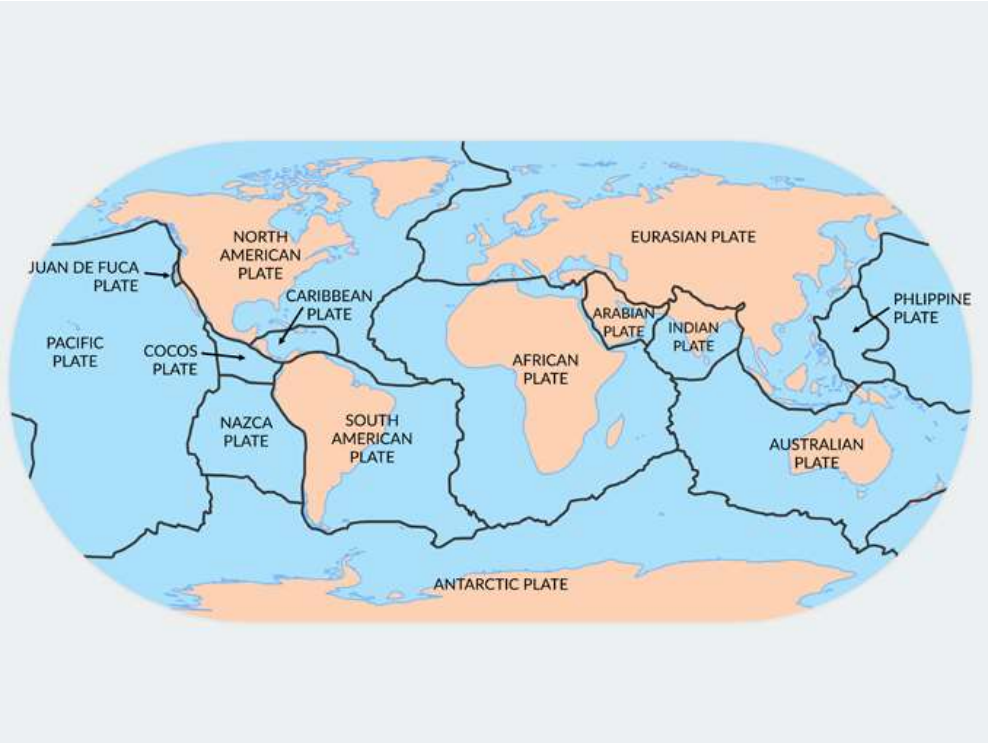
German meteorologist **Alfred Wegener**

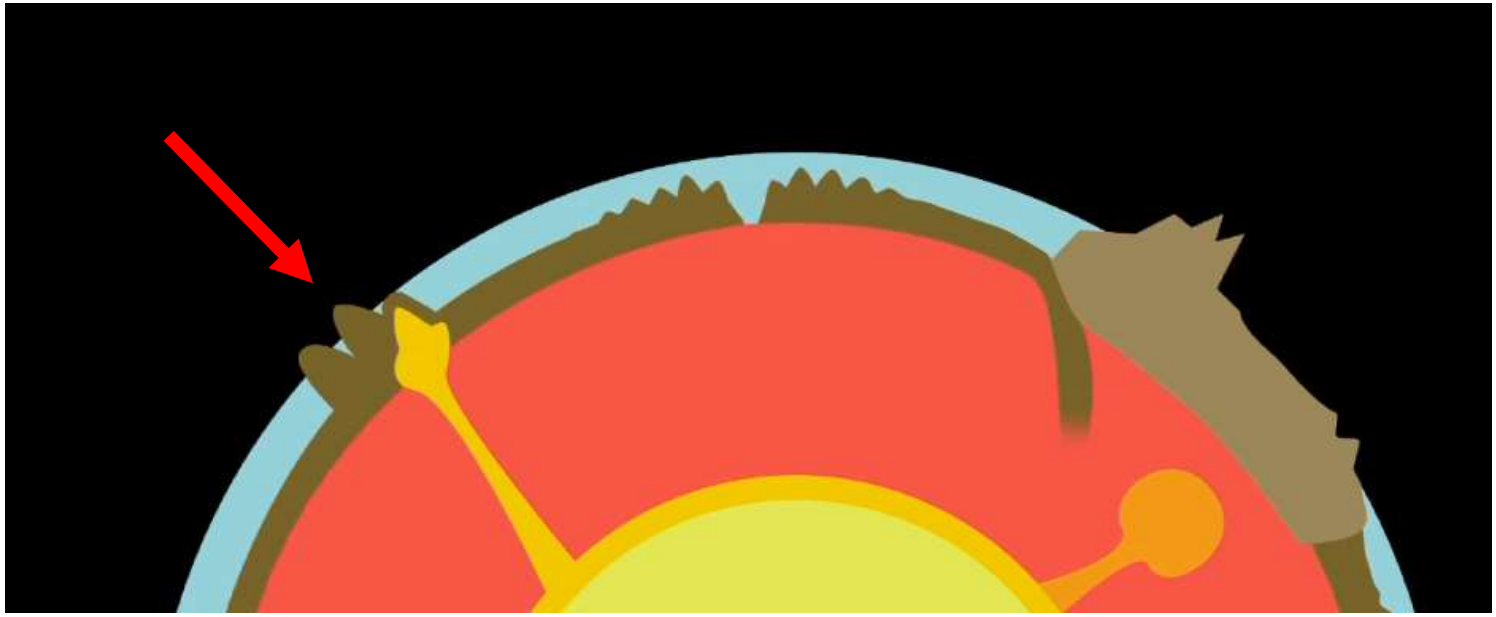


This explanation did not convince the majority of workers in either field, largely because of the lack of any known mechanism that could cause continents to move horizontally or to fragment.

P ory that Earth's land masses ar motion

1960s: Plate tectonics theory is the central paradigm of the earth sciences





From Vimeo video: https://vimeo.com/69911511

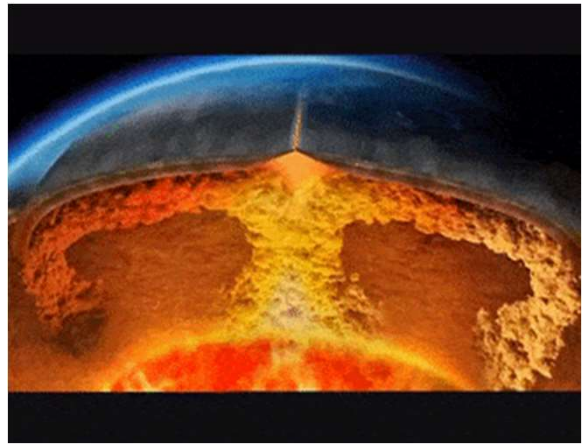
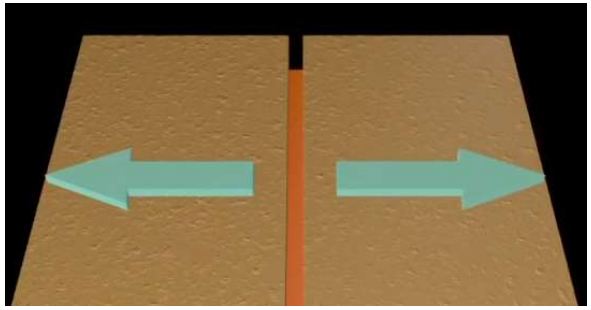


Plate boundaries are of 3 types

DIVERGENT MARGIN: plates spread apart (e.g. mid-Atlantic ridge)



CONVERGENT MARGIN: where one plate goes down and beneath another (subduction zone) (e.g. Japan)

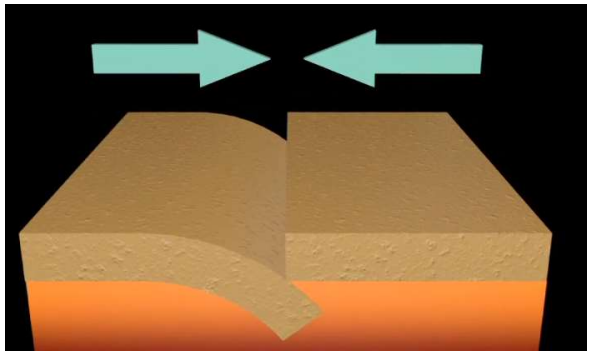
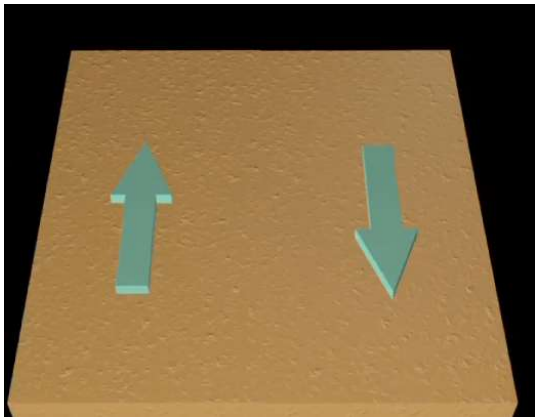


Plate boundaries are of 3 types

<u>TRANSFORM FAULT</u>: where the plates slide by one another (S. Andrea fault)



Temptation for workers in one field to accept, uncritically and without proper understanding, new ideas in the other field that seem to provide a solution

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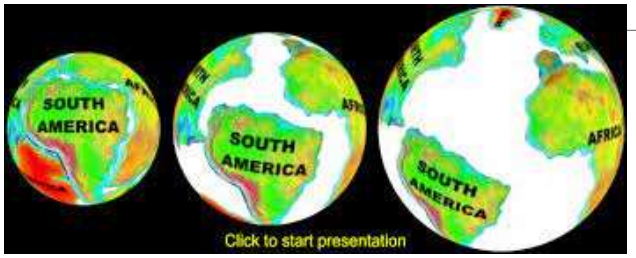
Published: 03 November 1977

Lost Pacifica continent

AMOS NUR & ZVI BEN-AVRAHAM

Nature **270**, 41–43 (1977) | Cite this article

207 Accesses | **83** Citations | Metrics



WILEY

JOURNAL ARTICLE

Guest Essay: New Geological Theories and Old Biogeographical Problems

C. Barry Cox

Journal of Biogeography
Vol. 17, No. 2 (Mar., 1990), pp. 117-130 (14 pages)
Published by: Wiley

J. Phys. Earth, **26**, Suppl., S 21–S 37, 1978

SPECULATIONS ON MOUNTAIN BUILDING AND THE LOST PACIFICA CONTINENT

Amos Nur* and Zvi Ben-Avraham**

*Department of Geophysics, Stanford University, Stanford, California, U.S.A.
**Department of Mathematics, Weizmann Institute of Science, Rehovot and the Israel Oceanographic and Limnological Ltd., Haifa, Israel

(Received October 6, 1978)

The notion of Pacifica and its breakup may provide an explanation for the similarities of flora, fauna, and rock sequences in widely separated locations in the mountain belts across the Pacific, and may tie in divergent paleomagnetic data.

Today, the acceptance of plate-tectonic theory is as complete as was acceptance of a stabilist Earth in Wegener's time. But also, now as then, some voices are being raised suggesting modifications to the accepted paradigm – slow or rapid expansion of the Earth, an ancient Pacifica continent, a mosaic of intrusive terranes inserted into the circum-Pacific continents, a radically different pre-Pangaea supercontinent. All these suggestions stimulate biogeographers to ponder again the implications for their own studies and, in particular, to consider whether any of these ideas may help to solve their own biogeographical problems. This requires not only an unprejudiced evaluation of the validity and scope of the new theories within the earth sciences, but also of their impact on biogeography as a whole. For it would be self-defeating to accept a theory which simplified existing biogeographical problems, if that same theory simultaneously disassembled the framework which at present explains the vast majority of biogeographical problems.

Main questions relating to Ecological zoogeography

Why is a species confined to its present range in space?

What enables it to live where it does, and what prevents it from expanding into other areas?

What roles do soil, climate, latitude, topography and interactions with other organisms play in limiting its distribution?

How do we account for the replacement of one species by another as one moves up a mountain or seashore, or from one environment to another?

Why are there more species in the tropics than in cooler environments?

Why are there more endemic species in environment X than in environment Y?

What controls the diversity of organisms that is found in any particular region?

Main questions relating to Historical zoogeography

How did the taxon come to be confined to its present range in space?

When did that pattern of distribution come to have its present boundaries, and how have geological or climatic events shaped that distribution?

What are the species' closest relatives, and where are they found? What is the history of the group, and where did earlier members of the group live?

Why are the animals of large, isolated regions, such as Australia or Madagascar, so distinctive?

Why are some closely related species confined to the same region, but in other cases they are widely separated?

Phyto vs Zoo

Plants

- static

- Form and growth closely related to environmental conditions

- easy to collect and preserve and to note soil and climate conditions in which they live.

- fossil remains less common

- seeds, wood, fruits and pollen difficult to be found associated among them.

- more difficult to interpretat

- taxonomy of flowering plants is based on flower morpho

Ecological biogeography

Animals

- not-static

- Less closely related to environmental and ecological conditions

- bone remains associated in skeletons (easy to allocate to the correct family)

Historical biogeography

At the beginning of the biogeography

Descriptive work

Mid-18th century: through worldwide explorations greater diversity of organisms was discovered.

Most people accepted the statements in the Bible: Earth and all living things that we see today had been created in a **single series of events** occurred a few thousands years before.

Since **God's actions** had always been **perfect**. **Animals and plants** that had been created were perfect, and **had not changed (evolved) or become extinct**, and that the world itself had always been as we see it today.

Explanation of the facts

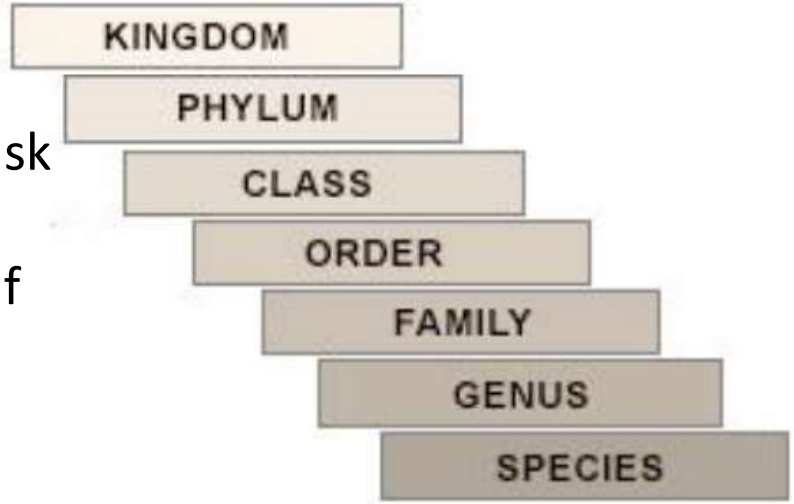
Between then and mid-20th century: the limited vision was gradually replaced by the realization that both the living world and the planet that it inhabits are continually changing, driven by two great processes – the **biological process of evolution** and the **geological process of plate tectonics**.

Carolus Linnæus (1708-1778)

- Swedish naturalist and taxonomist

- Developed a system to classify life that included binomial nomenclature

- Believed in Creation and thought it was his task to catalogue all of God's creations – called himself «God's registrar»

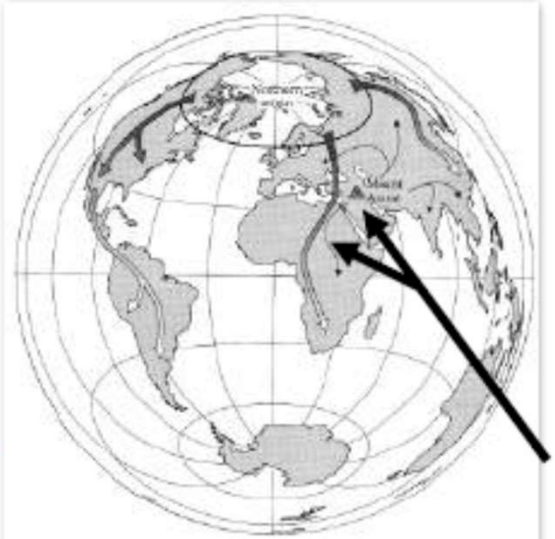


- He thought species were immutable, a question he pondered was:

How did different species become adapted to so many different environments?

His explanation was that Noah's Ark had landed on Mount Ararat

- This tall mountain had many different elevational zones
- Each immutable species was already adapted to a particular zone
- Each species spreads out to its respective environment over the globe after the Great Flood



He recorded also whereabouts in the world each species is found, but he did not synthetise these observations into floral or animals assemblages of the different continents or regions.

Georges-Louis Leclerc de Buffon

(1) He oserved that different parts of the world, even those with similar conditions, where inhabited by distinct kind of plandts and animals.

(2) He found it unlikely that all species would be able to disperse across inhospitale habitats (and there were many inhospitale barriers)

Buffon's Law:

environmentally similar but isolated regions have distinct assemblages of mammals and birds

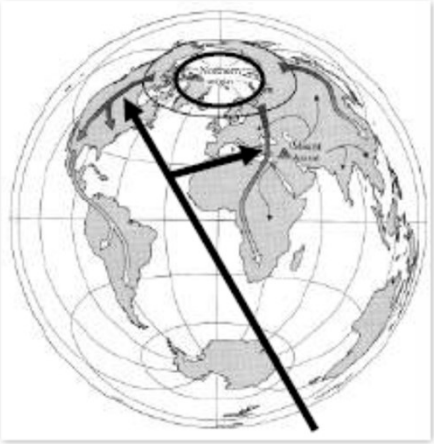
Buffon's hypothesis of species dispersal

He suggested that America and Eurasia were in the «Old World» adjacent.

↓

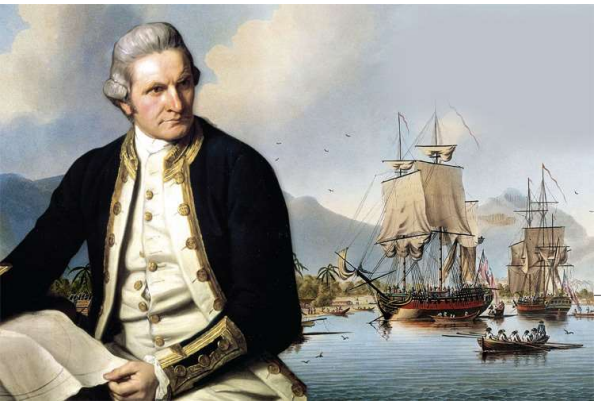
Different mammals sought out whichever area they found most congenial (Species Dispersion)

↓

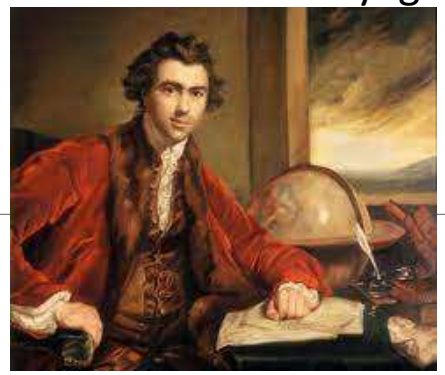


Only later the ocean separated the two continents, and the two **now-different faunas** might have been due to the action of the **climate.**

Buffon used **fossil records** to reconstruct life history (ten thousands of yrs). Only in the **last part the human beings arrived**. In earlier periods **tropical life had covered areas that now are temperate or subarctic**.

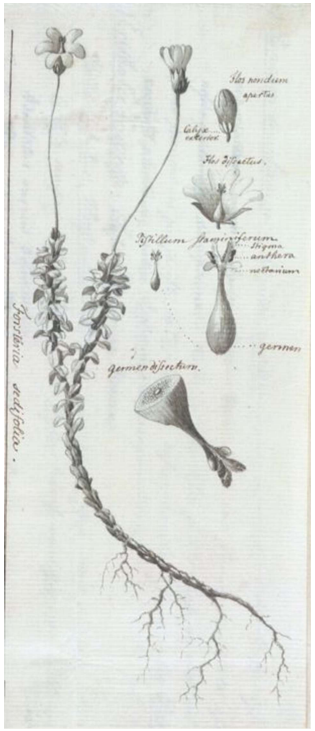


1772-1775 in his second voyage around the world, Captain James Cook and



British botanist Joseph Banks

German Johann Reinhold Forster
and his son Georg Foster



Foster found Buffon's Law applied to plants as well as animals, and also applied to any region of the world that was separated from others by geographical or climate barriers.

↓

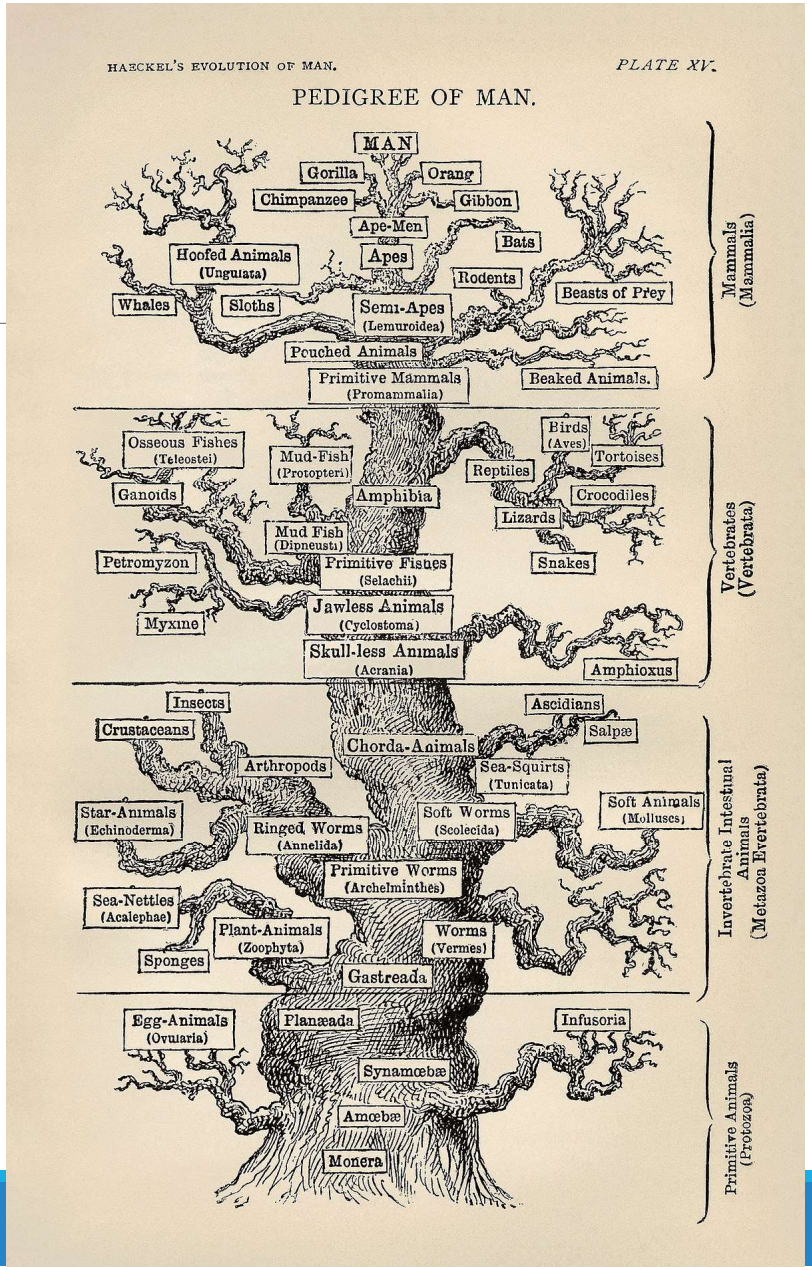
He realised the existence of the now-called GRADIENTS OF DIVERSITY

First seeds about the Evolution

Late 18th century: SCALE OF BEINGS

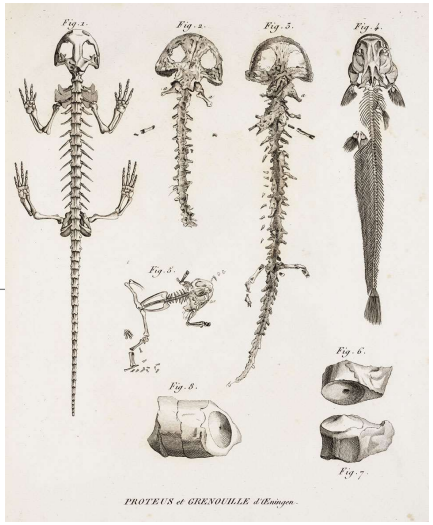
Different groups of organisms could be allocated to ‘lower’ or ‘higher’ places according to the level of ‘perfection’ of their organisation, with human beings at the apex.

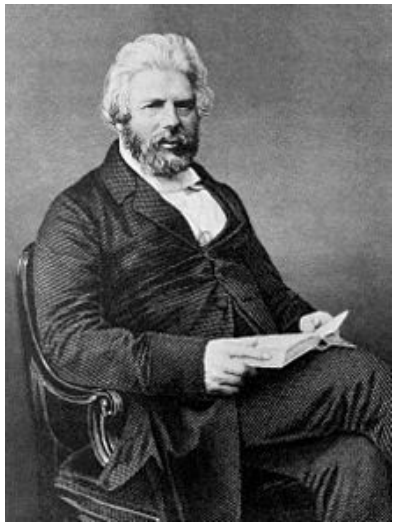
Lamarck (1802) suggested that ‘lower’ organisms might be found earlier in time and that they might gradually change intothe ‘higher’ forms, due toan ‘inherent tendency of life to improve itself’

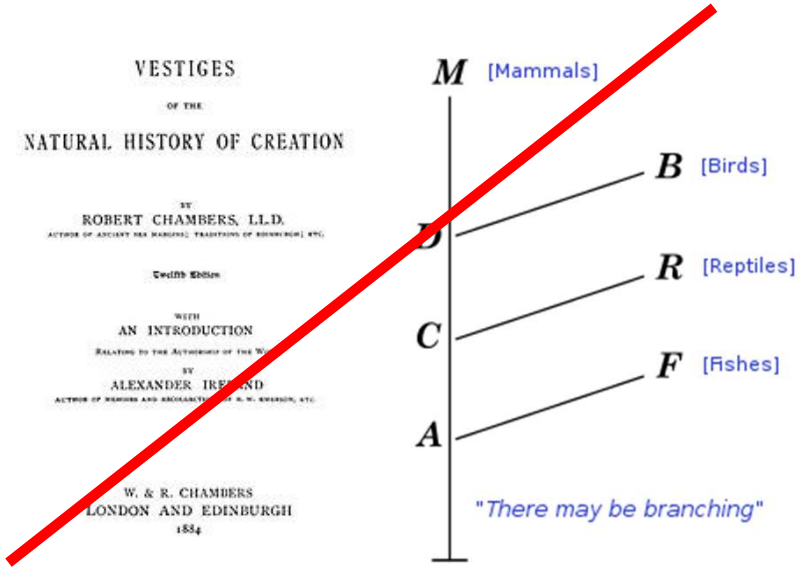


Mammoths of Europe and North America, as well as many others, belonged to a quite different species from those of today and were **extinct**

→ Opponent of Lamarck's theories







The progressively more **detailed fossil record** that was by then being revealed also gave **no hint** or indication that the **major groups of organisms**, traced back in time, **converged towards a common**, ancient **ancestor**.