

Caffè SCIENZA 2010/2011

# *Alla ricerca della grande unificazione*

con Giovanni Amelino Camelia, fisico, Telmo Pievani, filosofo

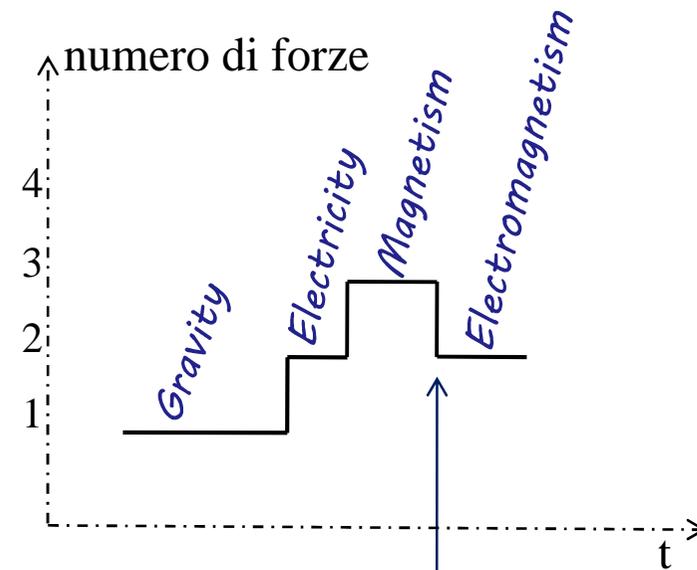
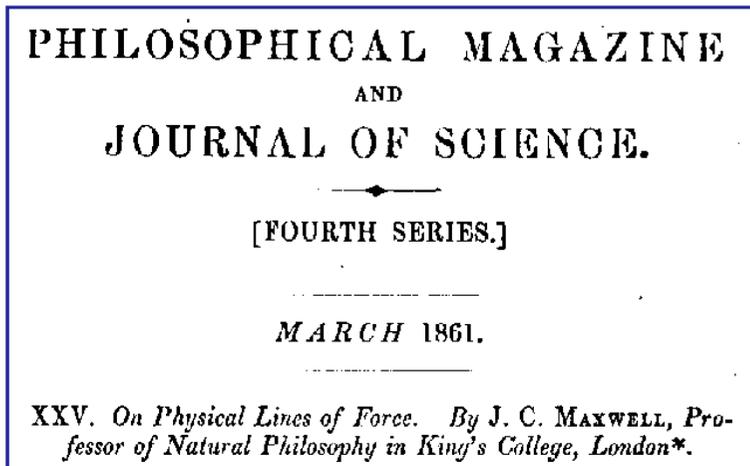
Martedì 15 marzo 2011, ore 20,30

assaggi science bookshop via degli Etruschi 4 Roma

quest'anno festeggiamo il  
150esimo della unificazione .....



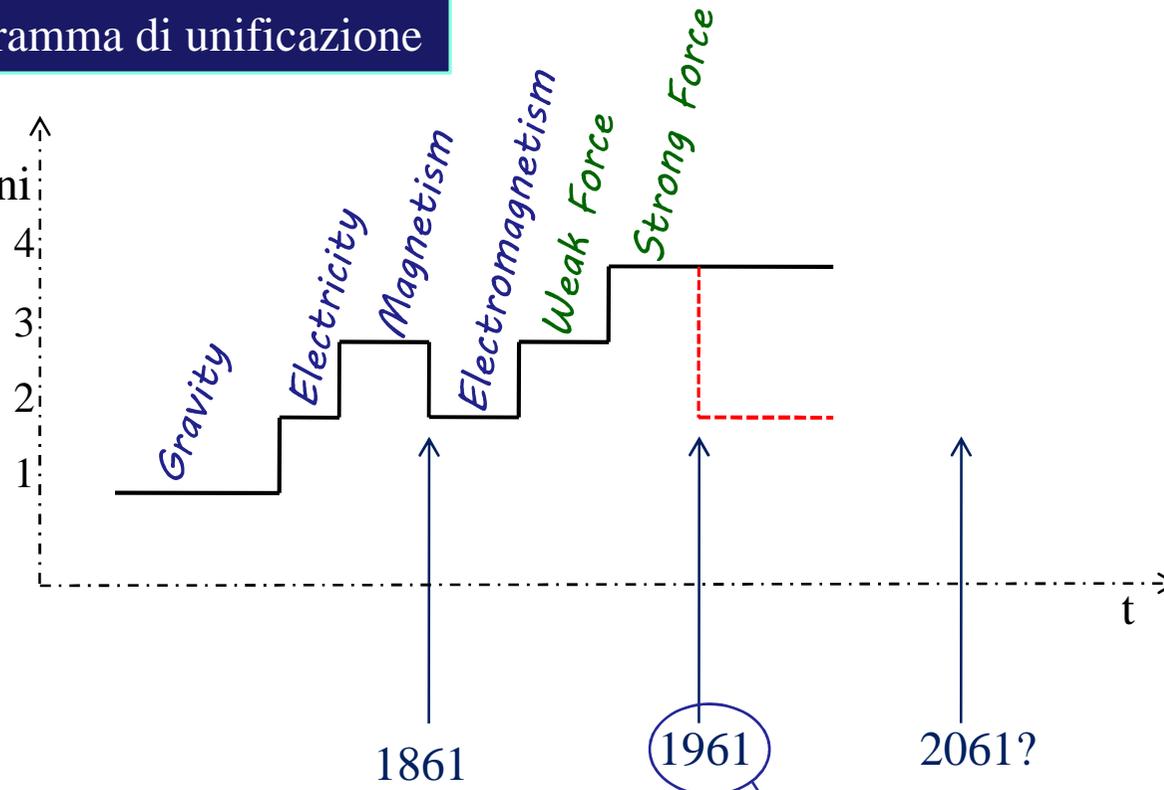
anche della unificazione di elettricità e magnetismo!!



1861

# stato attuale del programma di unificazione

numero di forze al  
netto di unificazioni:



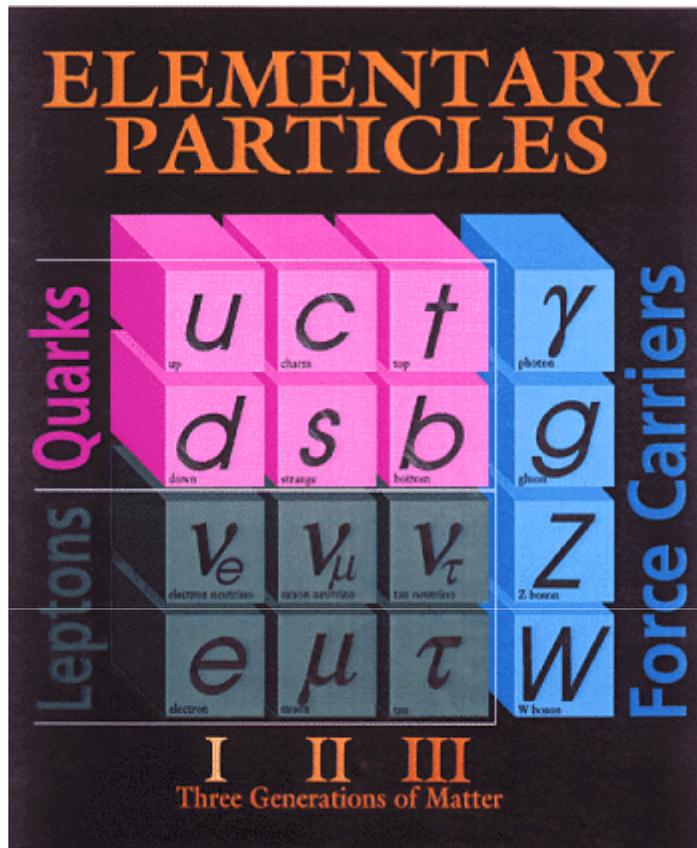
PHYSICAL REVIEW LETTERS 20 NOVEMBER 1967

A MODEL OF LEPTONS\*  
Steven Weinberg†

<sup>1</sup>The history of attempts to unify weak and electromagnetic interactions is very long, and will not be reviewed here. Possibly the earliest reference is E. Fermi, Z. Physik 88, 161 (1934). A model similar to ours was discussed by S. Glashow, Nucl. Phys. 22, 579 (1961); the chief difference is that Glashow introduces symmetry-breaking terms into the Lagrangian, and therefore gets less definite predictions.

Nuclear Physics **22** (1961) 579—588; © North-Holland Publishing Co., Amsterdam  
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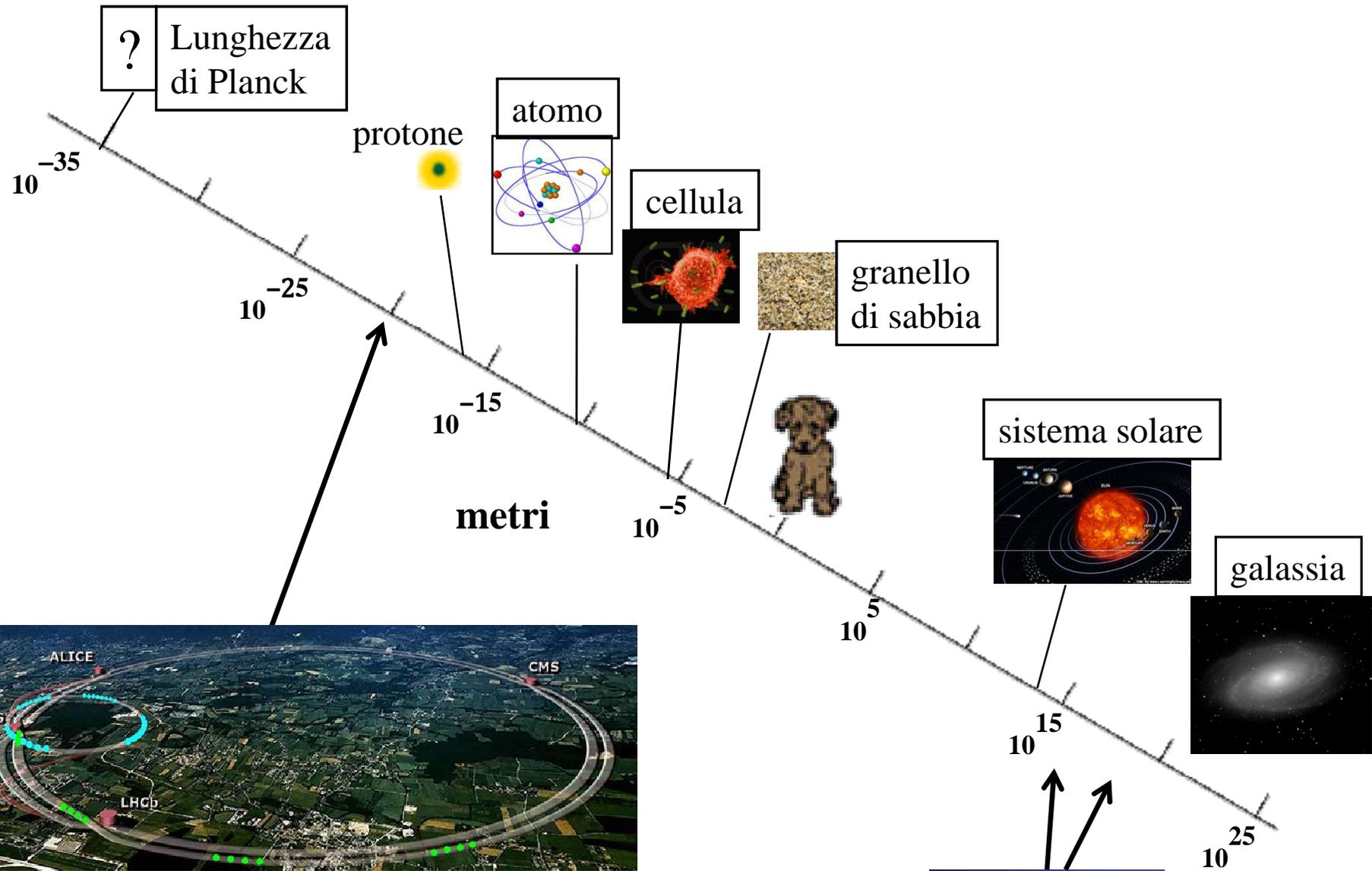
PARTIAL-SYMMETRIES OF WEAK INTERACTIONS  
SHELDON L. GLASHOW †



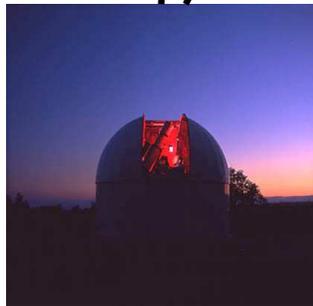
omettendo proprieta' e fenomeni gravitazionali!!

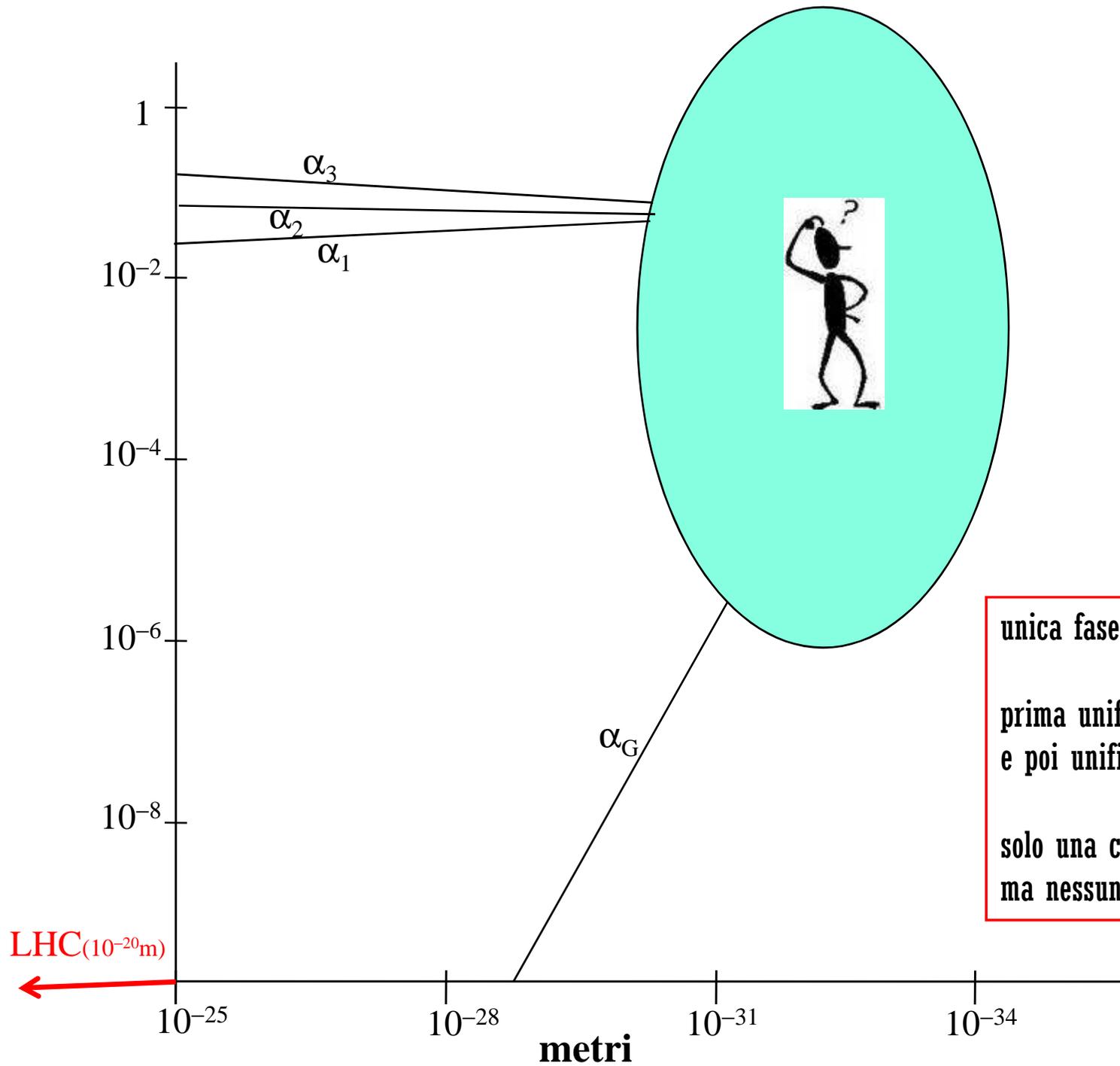


"Putting a box around it, I'm afraid, does not make it a unified theory."



LHC



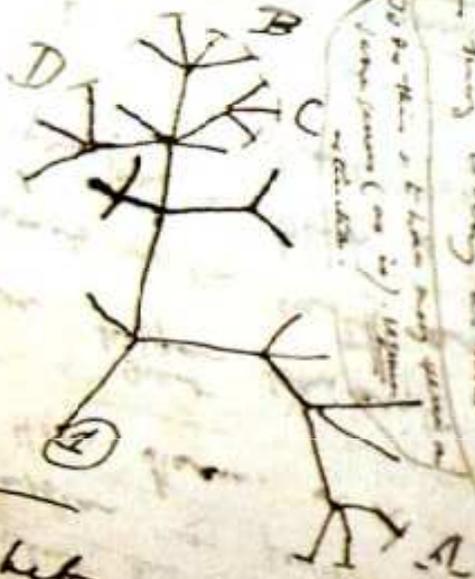


unica fase di unificazione?

prima unificazione nongravitazionale  
e poi unificazione completa?

solo una coincidenza numerica  
ma nessuna unificazione?

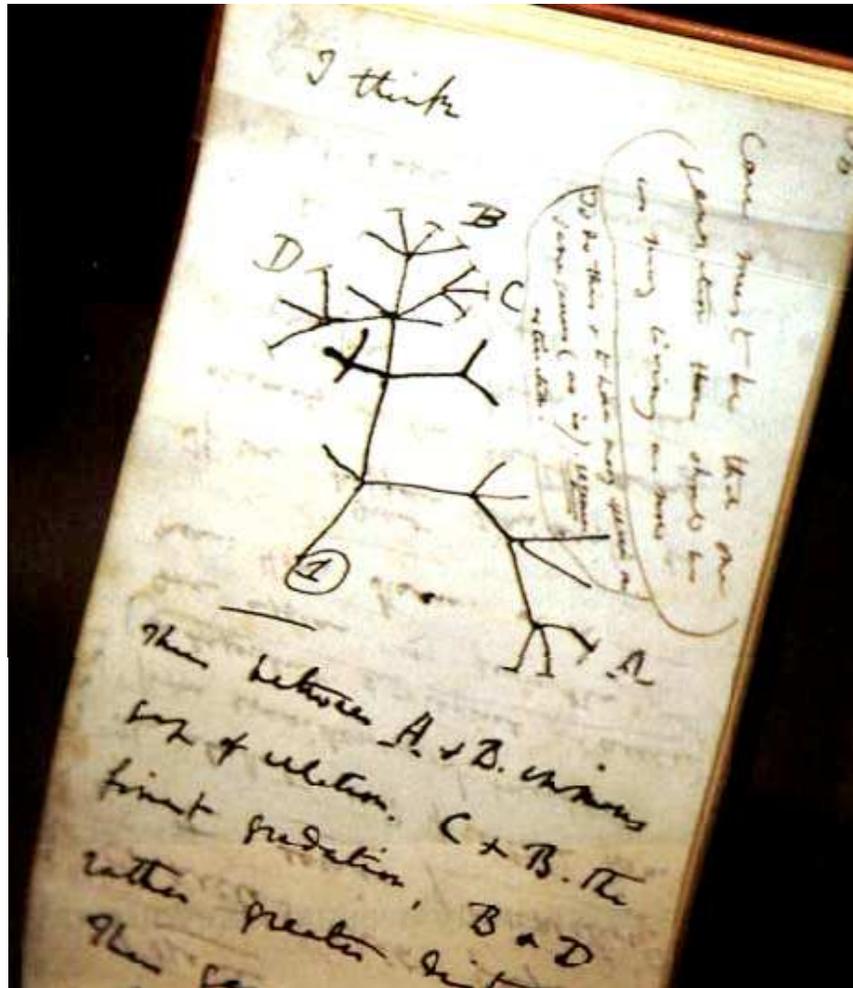
I think



Some things to be taken into  
consideration when trying to  
construct a tree of life are  
the degree of similarity between  
living organisms (as in)  
the fossil record.

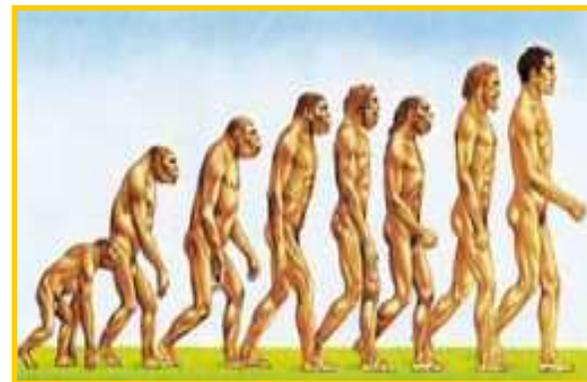
There is a greater distance  
between A & B. whereas  
C & D. The  
distance between B & D  
is greater than  
between A & C.

Notebook B, July 1837



## Superiore/inferiore?

“Quando parliamo di ordini superiori, dovremmo sempre dire intellettualmente superiori. Ma chi, al cospetto della Terra, coperta di splendide savane e foreste, oserebbe dire che l’intelletto è l’unico scopo di questo mondo?” (Notebook B, p. 252)



?

?

**Fatto 1: Potenziale crescita esponenziale delle popolazioni.**

**Fatto 2: Le popolazioni sono stabili.**

**Fatto 3: Le risorse sono limitate.**

**Deduzione 1: Lotta per l'esistenza.**

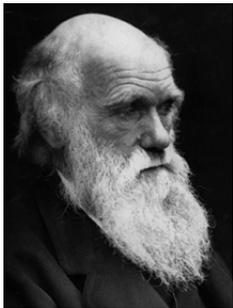
**Fatto 4: Diversità del singolo individuo.**

**Fatto 5: Ereditarietà di una parte della variazione individuale.**

**Fatto 6: La variazione non è direzionata.**

**Deduzione 2: Sopravvivenza differenziale (selezione naturale).**

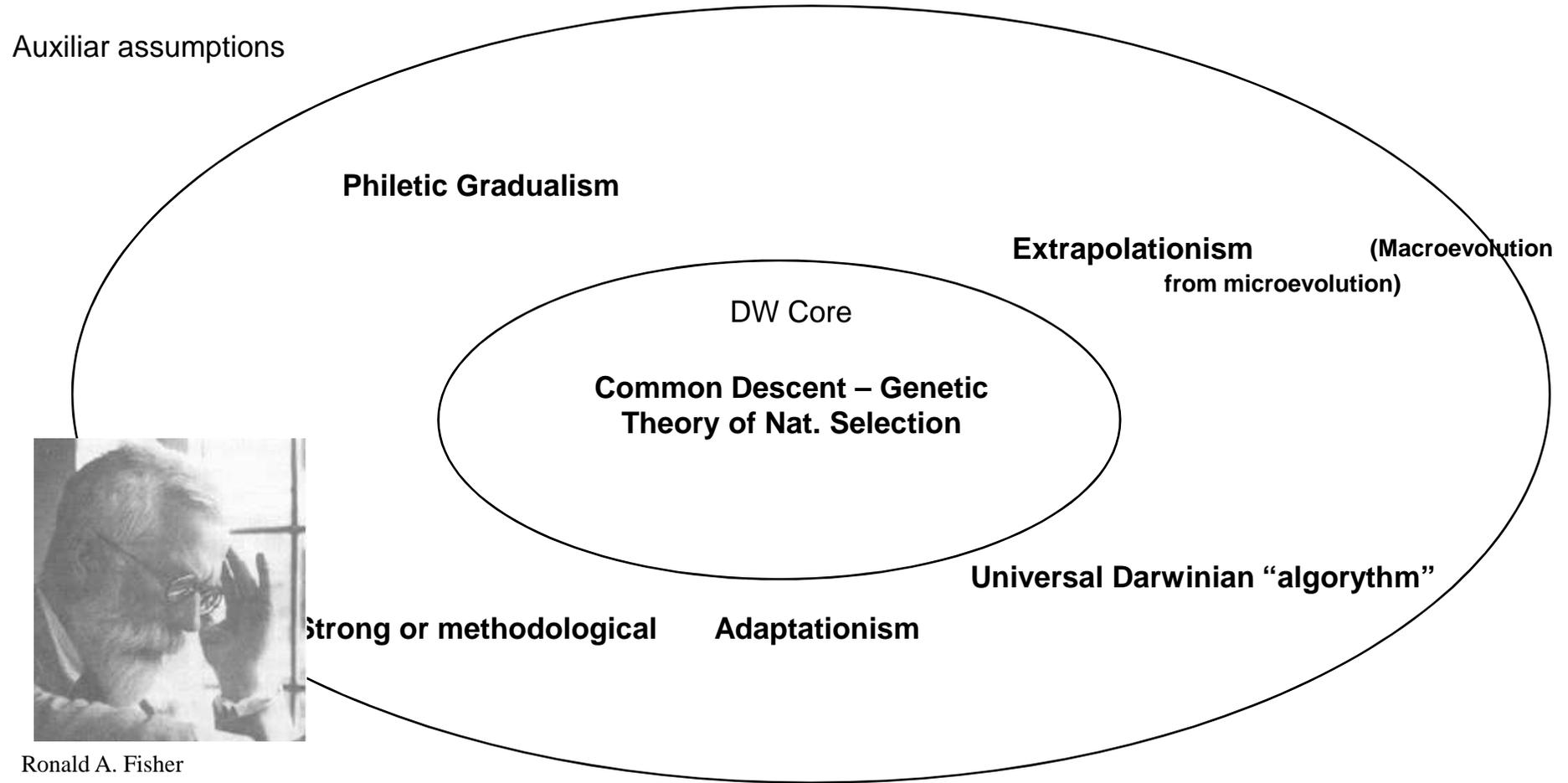
**Deduzione 3: Successo riproduttivo differenziale per molte generazioni: la popolazione EVOLVE.**



**Caso? Adattamento? Velocità? Unità?**

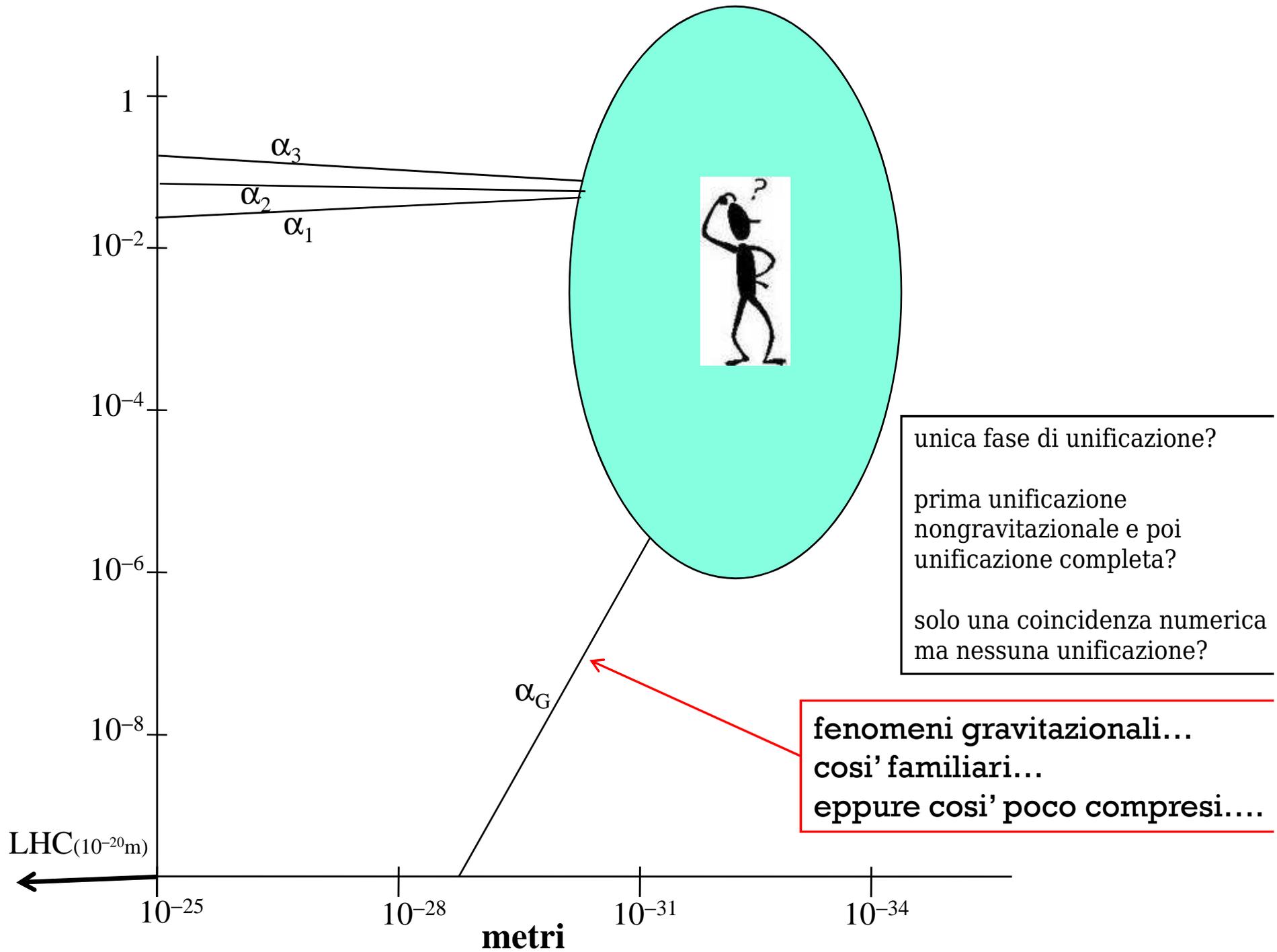
# ERP1 - MODERN SYNTHESIS

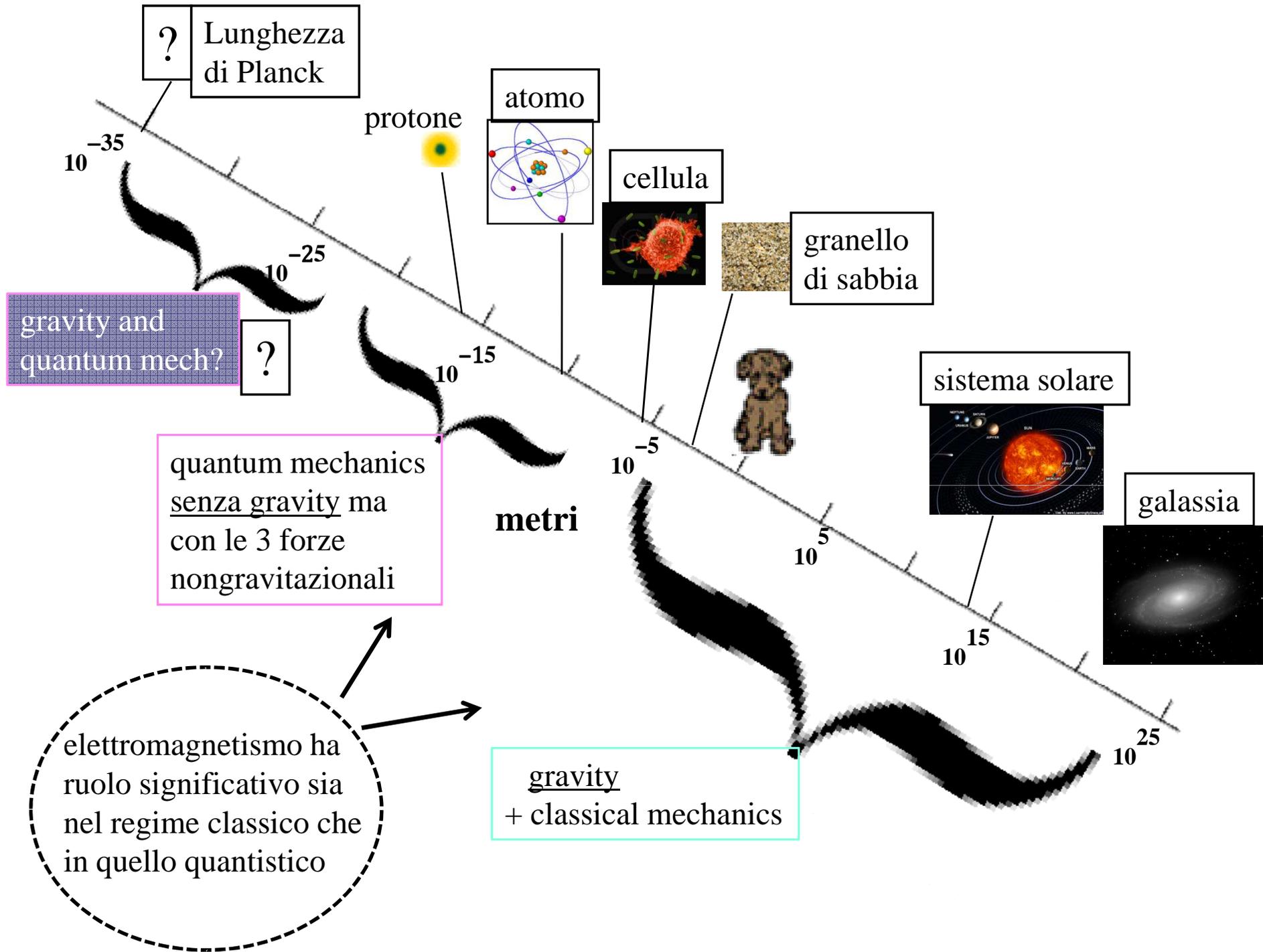
(not a monolith, but an open yard)

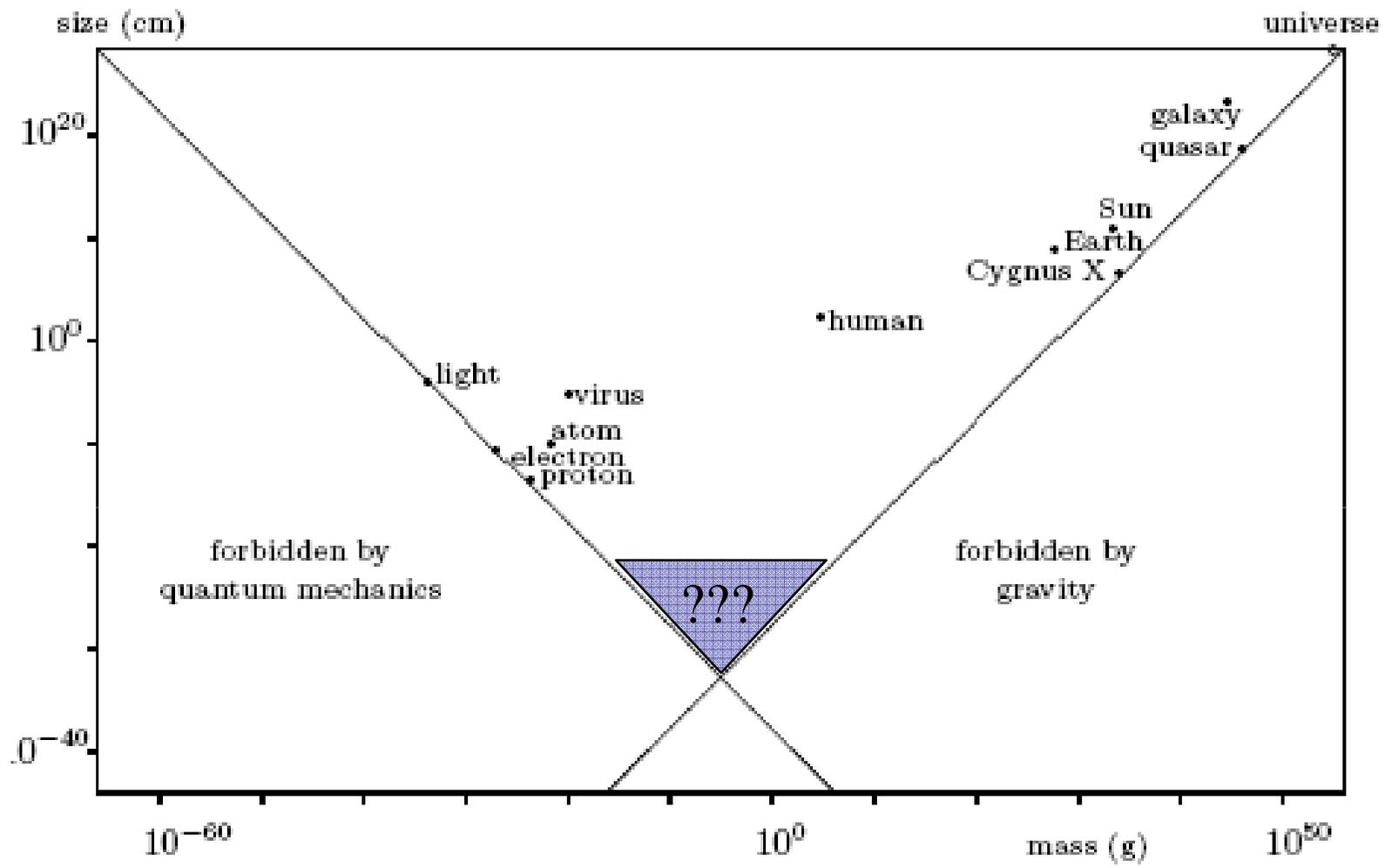


Great explanatory capacity

Coherent theoretical framework

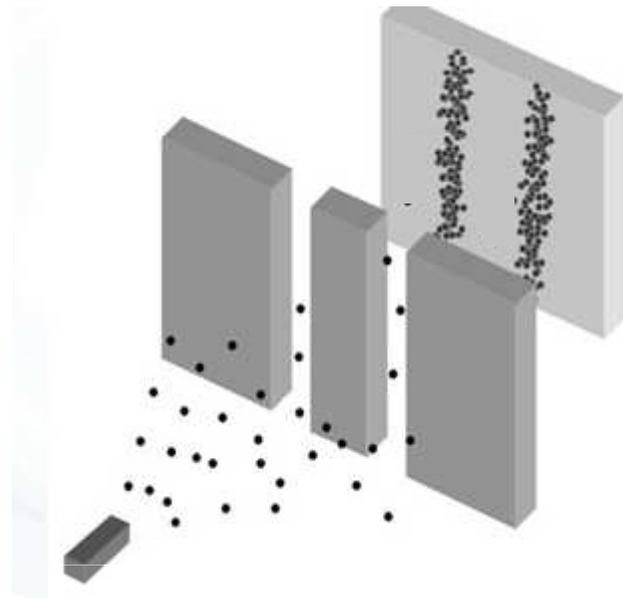
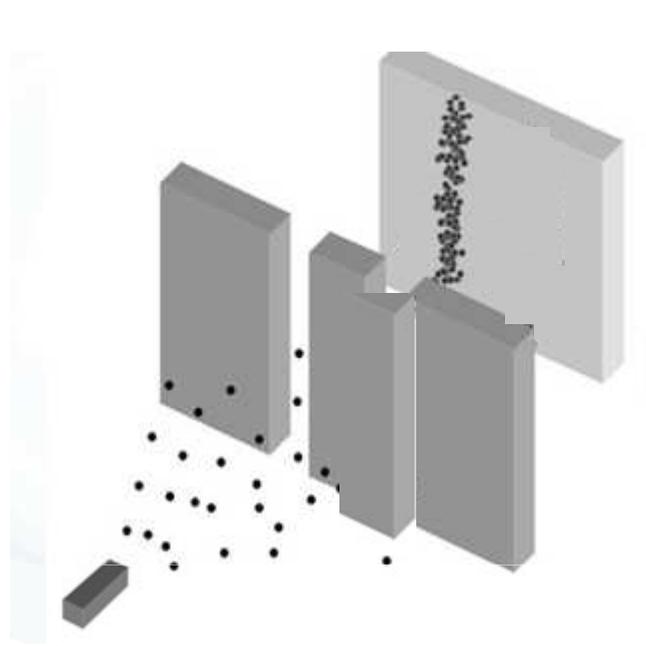




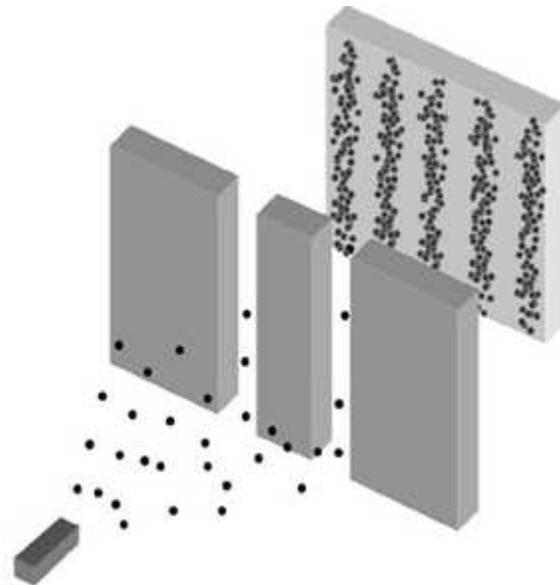
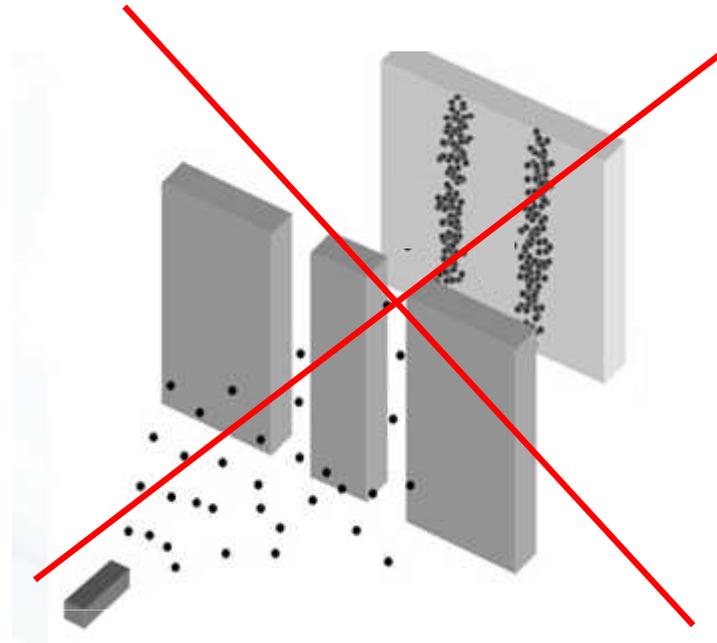
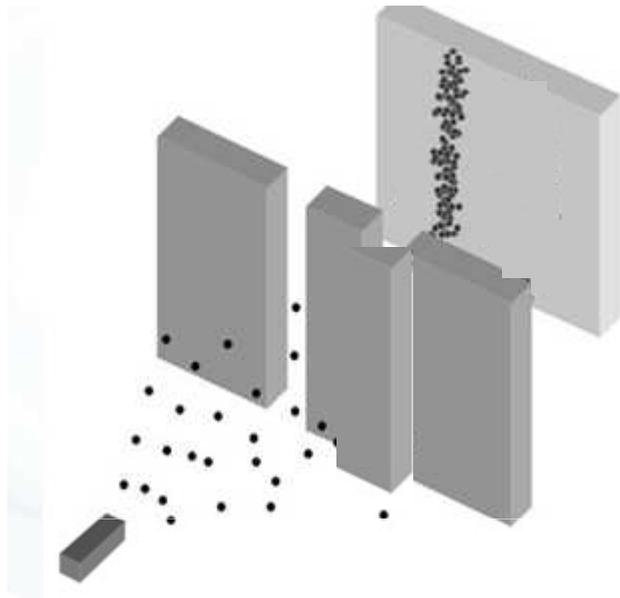


book *Foundations of Quantum Group Theory* by Shahn Majid,

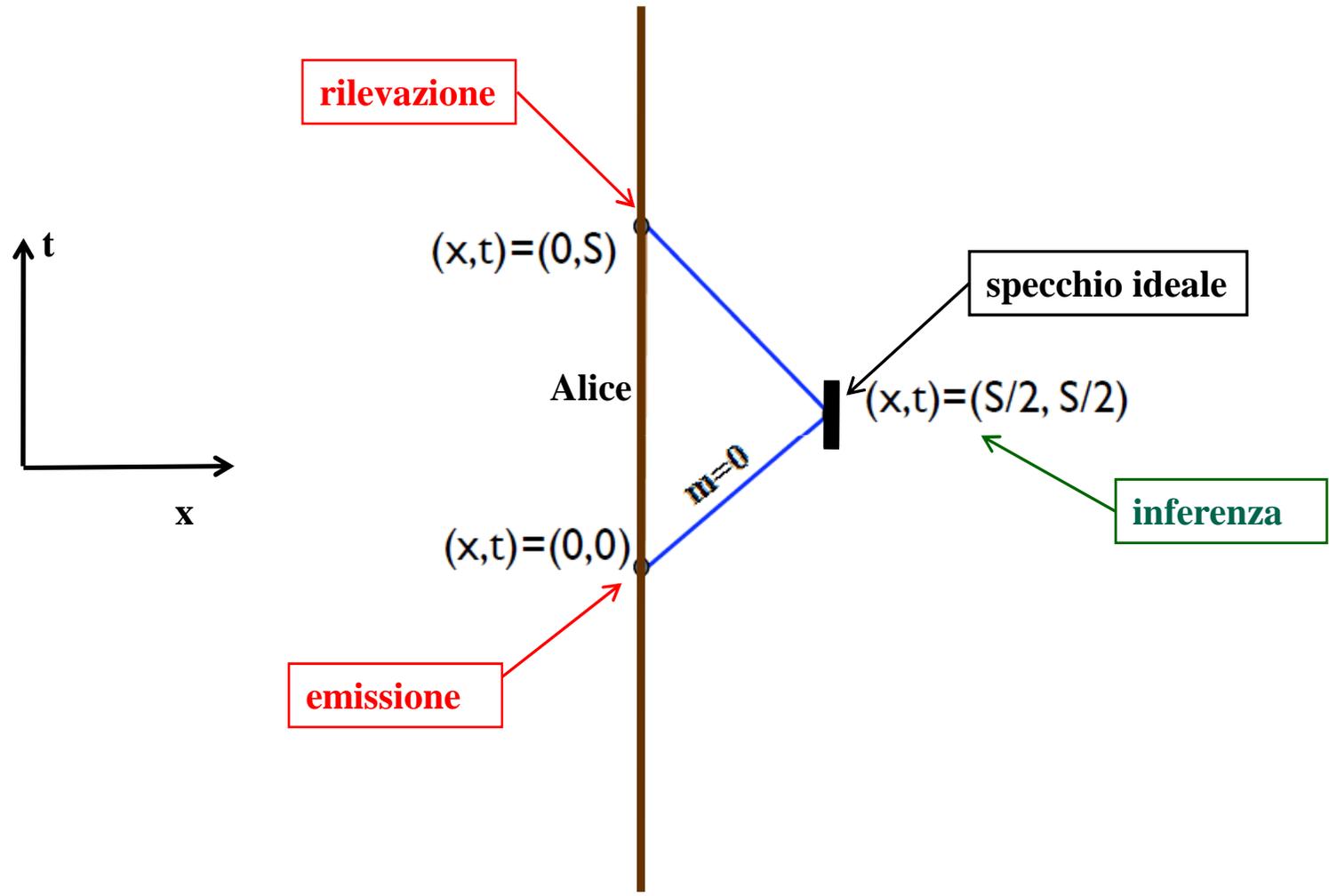
meccanica quantistica  
e le inferenze ingannevoli



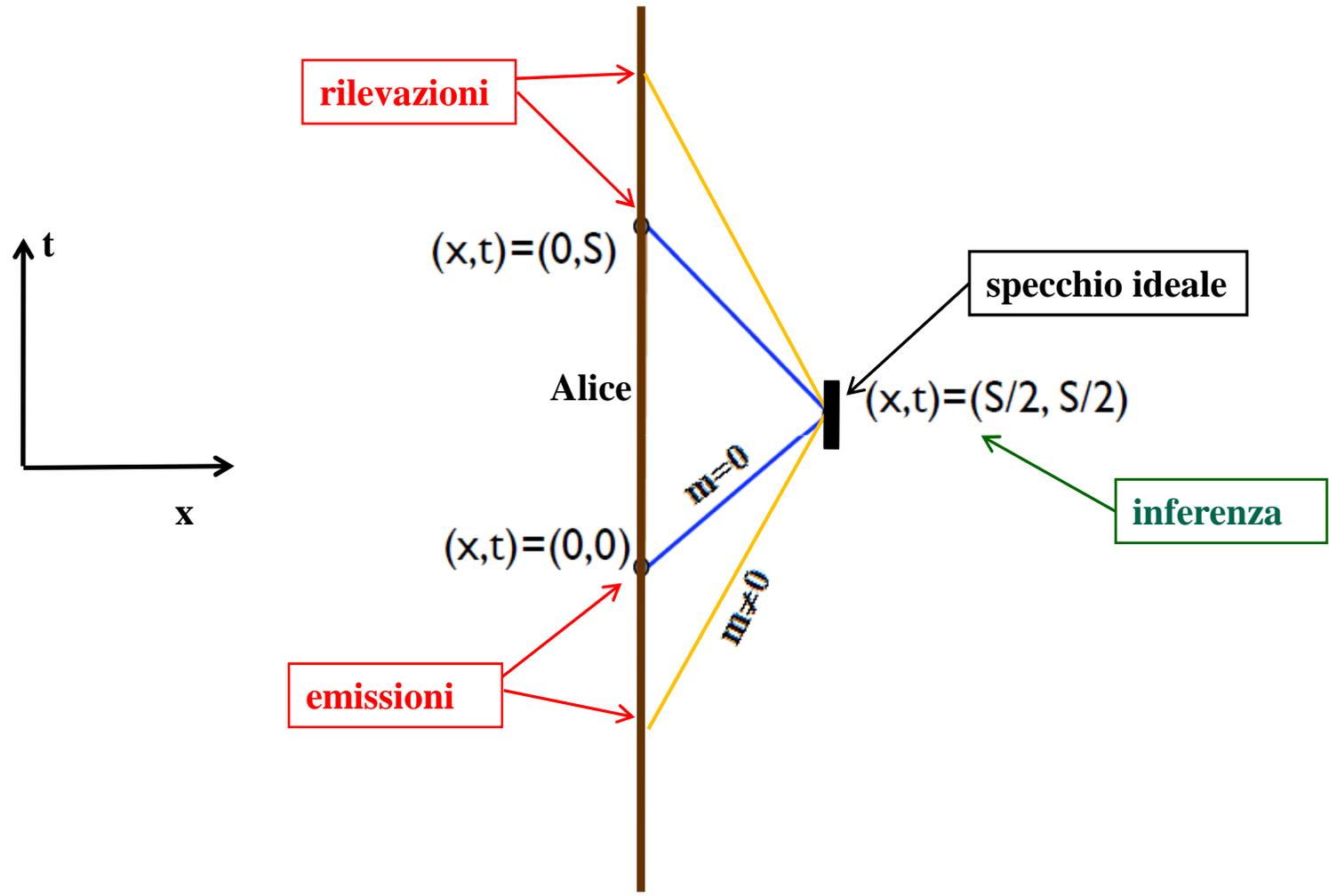
meccanica quantistica  
e le inferenze ingannevoli



“problema della gravita’ quantistica”:  
altre inferenze ingannevoli??



“problema della gravita’ quantistica”:  
altre inferenze ingannevoli??



# ERP2: A DARWINIAN

# EXTENDED CORE



**MUTATION**

(sources of variation)

**NATURAL SELECTION**  
processes)

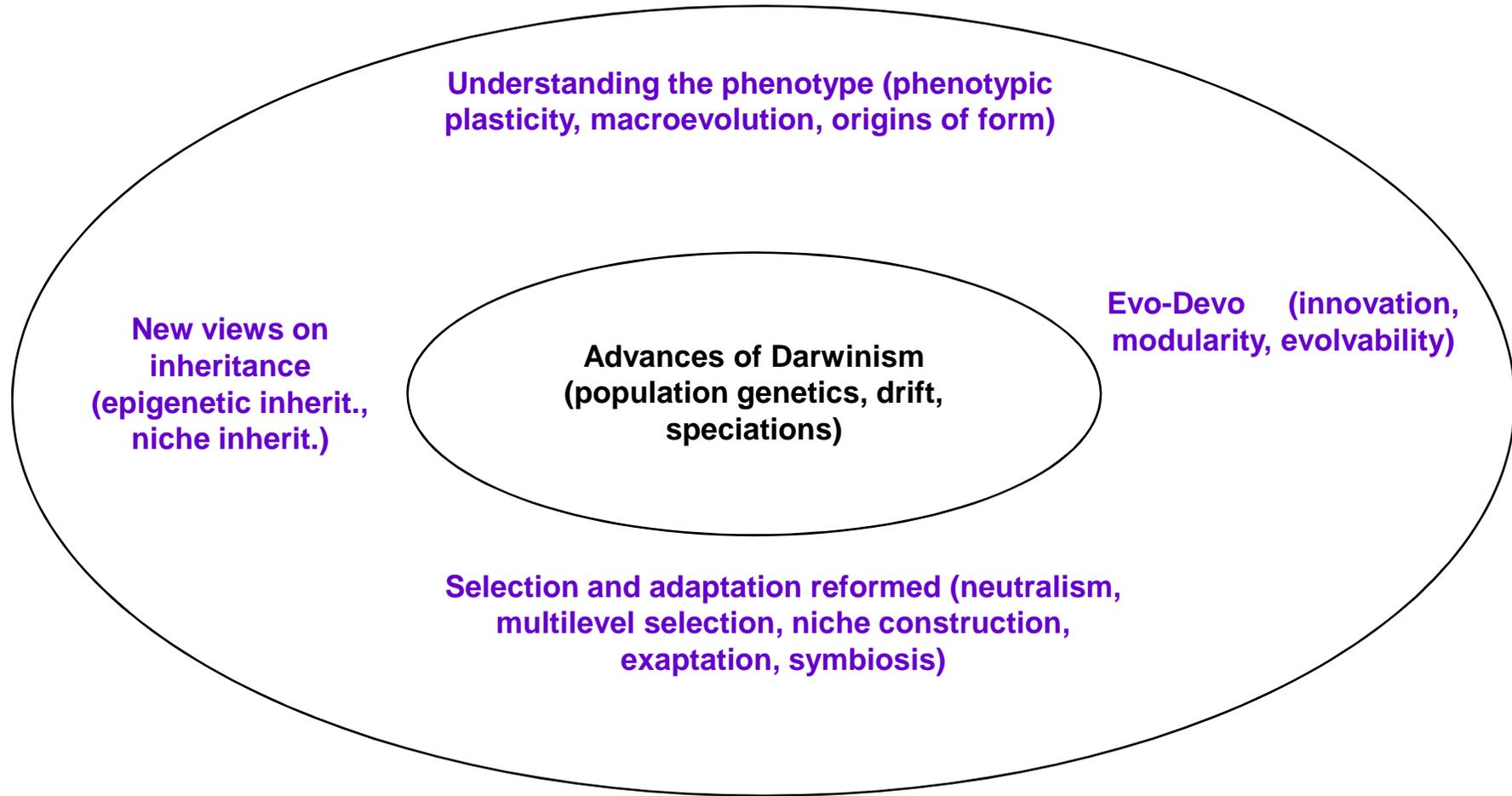
(selective

**GENETIC DRIFT** (neutralistic  
processes)

**MACROEVOLUTION**  
(migrations, adaptive radiations, mass  
extinctions...)

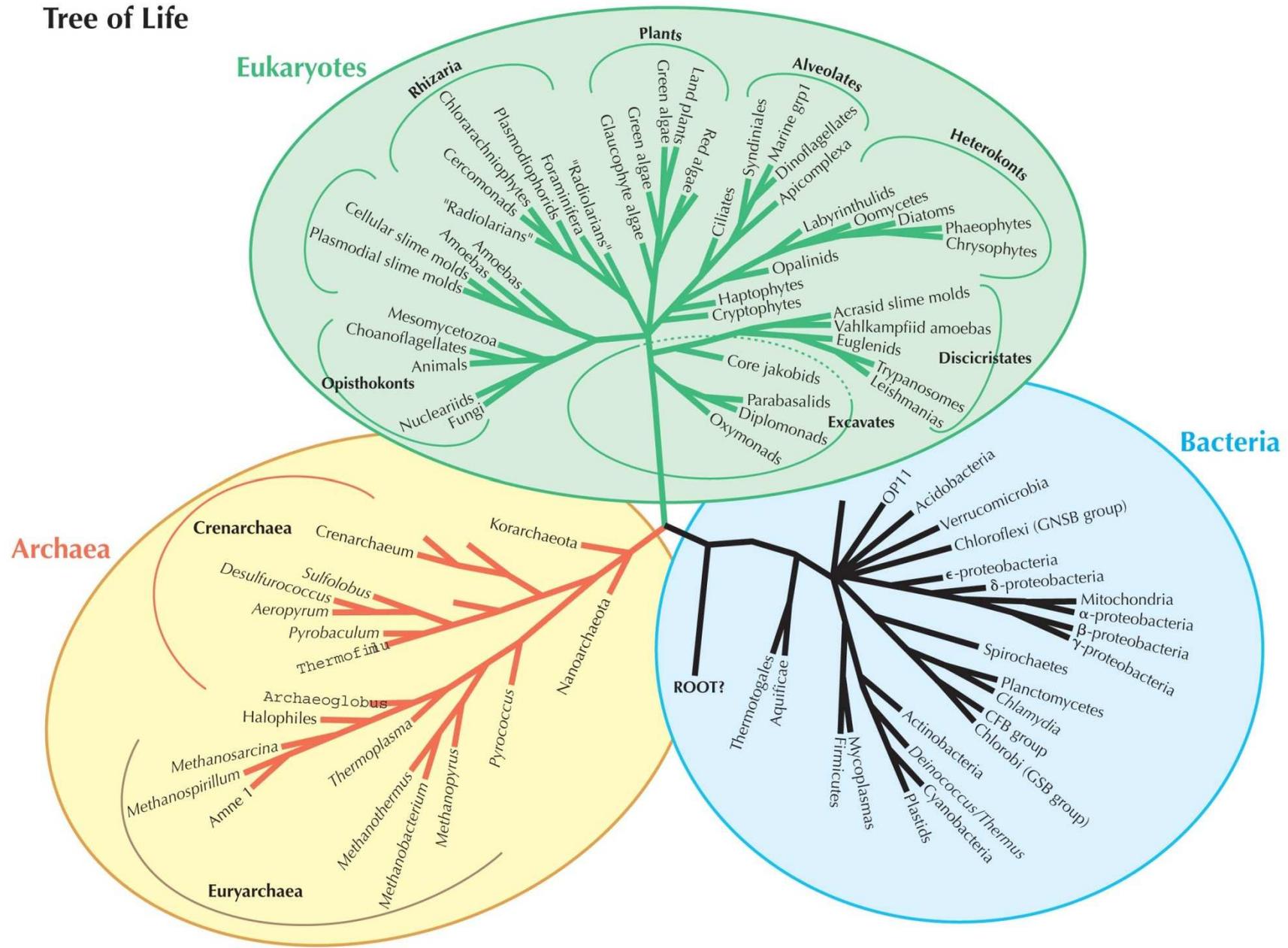
# EXTENDED DARWINIAN SYNTHESIS

(more empirical contents and predictions of “new facts”)



The evolving structure of Darwinian Research Program

# Tree of Life



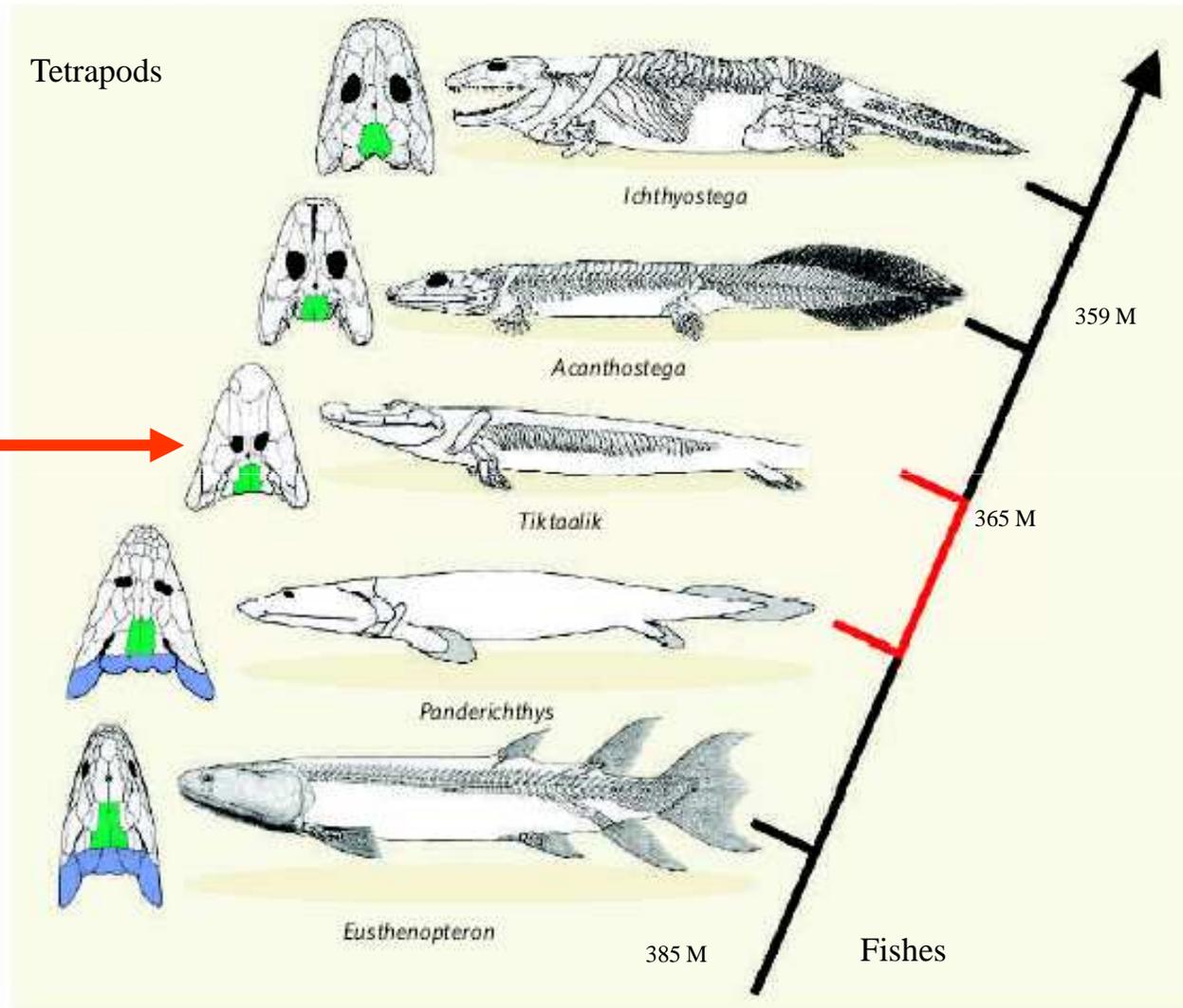
(Baldauf et alii, *Assembling the tree of life*, 2004; Model Selection for Univ. Com. Anc., 2010)

“A firm step from water to land” (*Nature*, 440, April 2006)

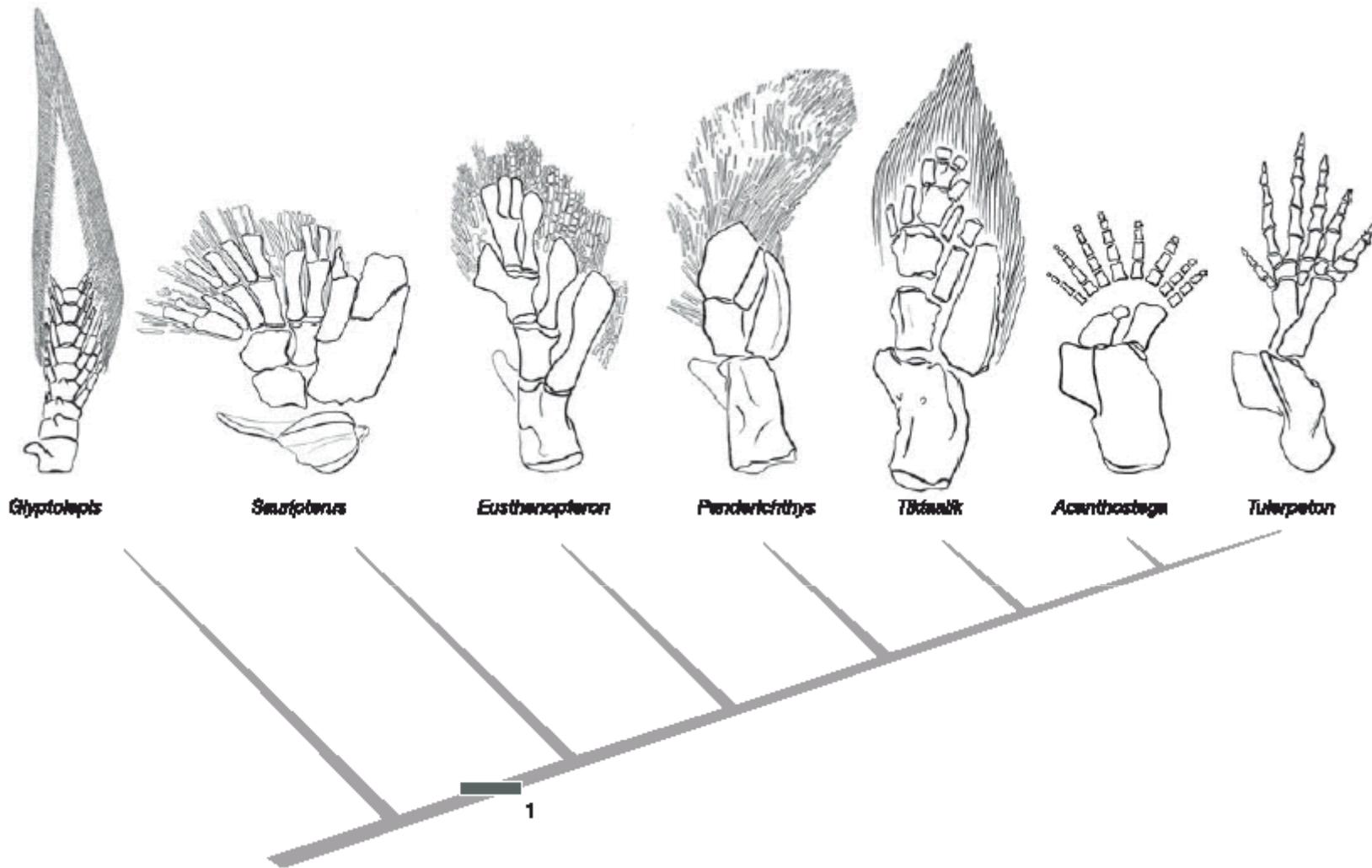
*Tiktaalik roseae* – Ellesmere Island, Nunavut, Arctic Canada (Shubin, Daeschler, Jenkins, *Nature*, 440, 2006)

Single intermediate fossil?  
Missing link?

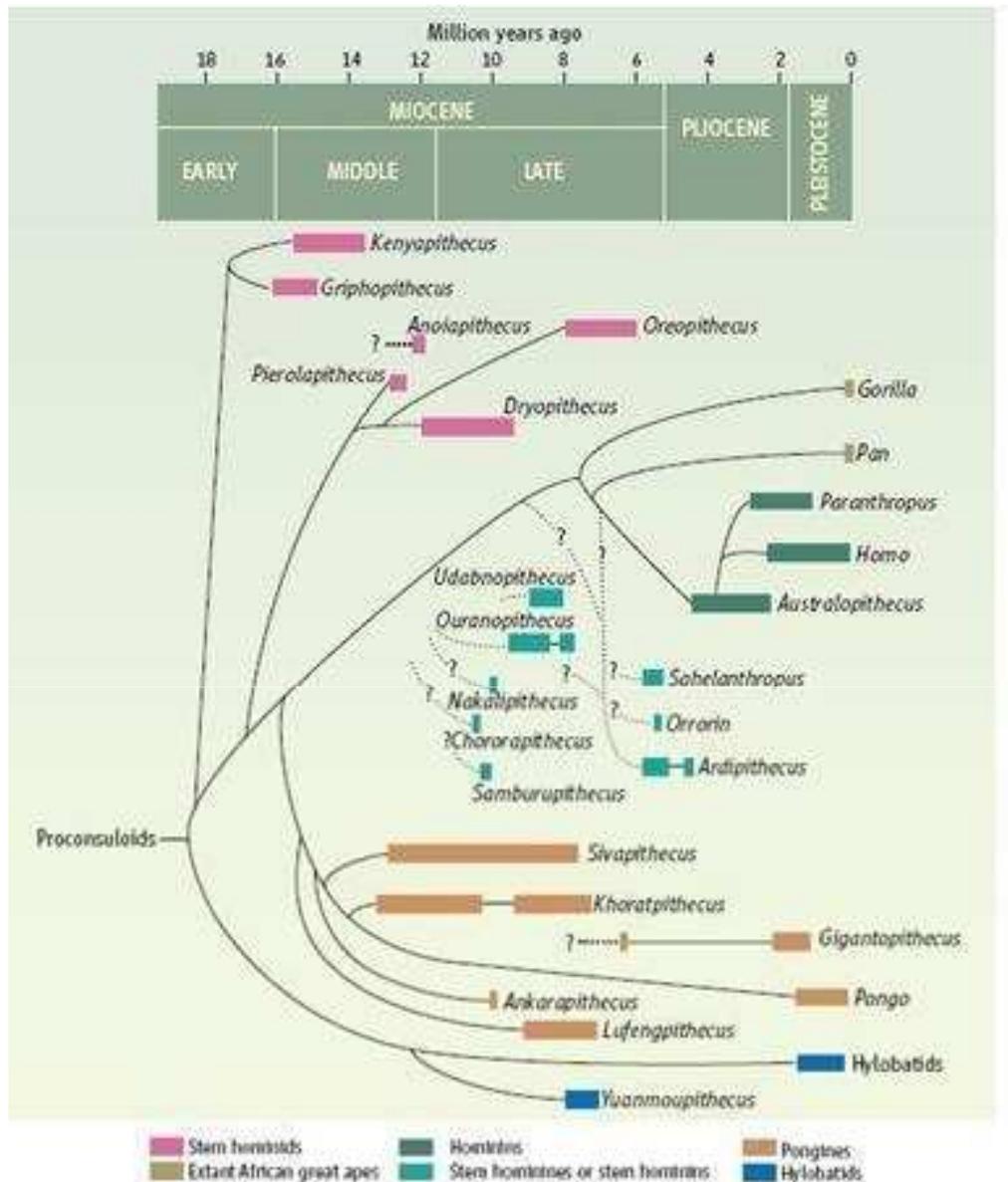
What is the right pattern for vertebrate transition from water to land?



Classic picture Devonian–Carboniferous: LINEAR ANAGENESIS?

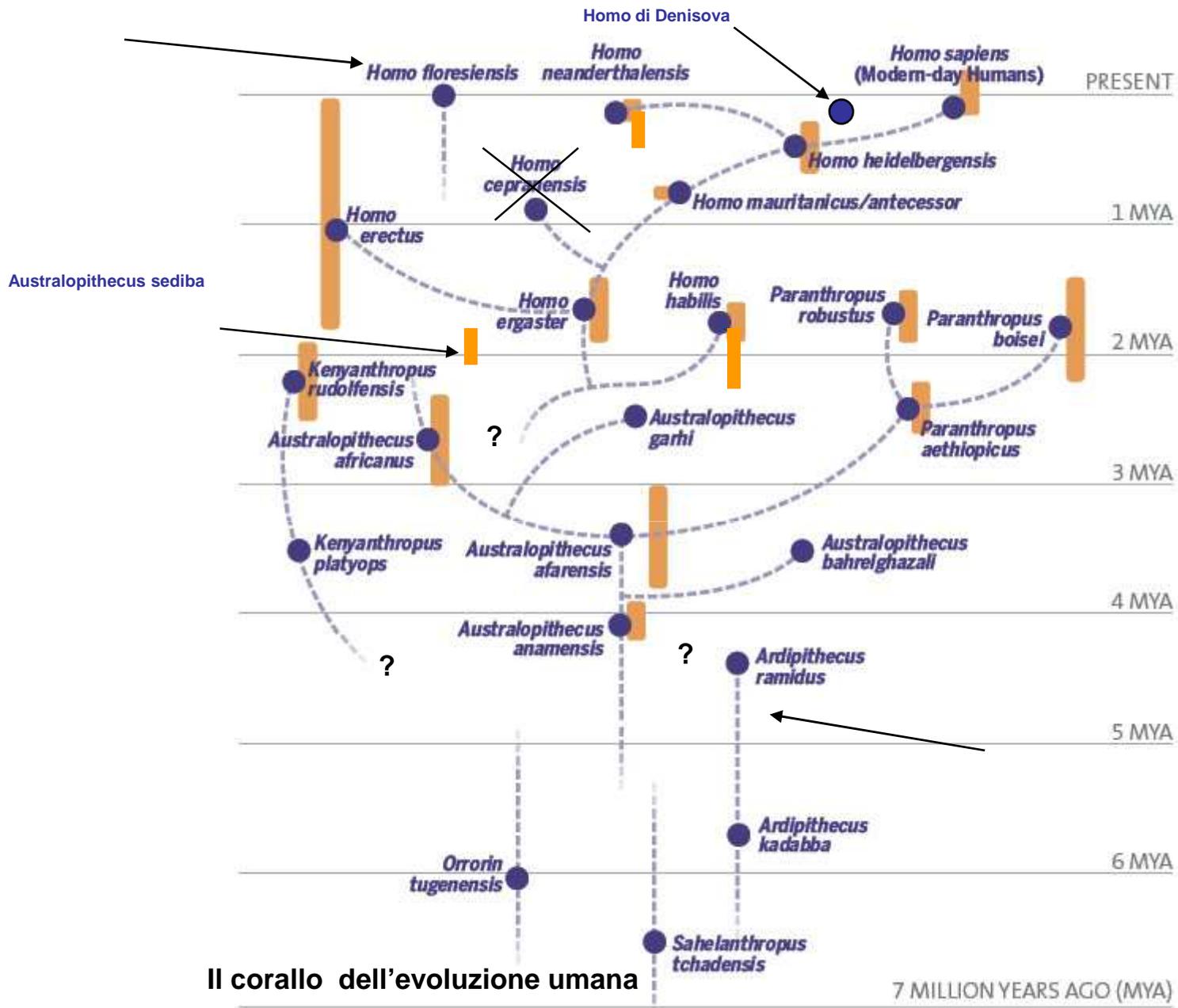


- Multiple adaptive solutions (different combinations of “retained” and “modern” characters)
- Exaptation fins-limbs



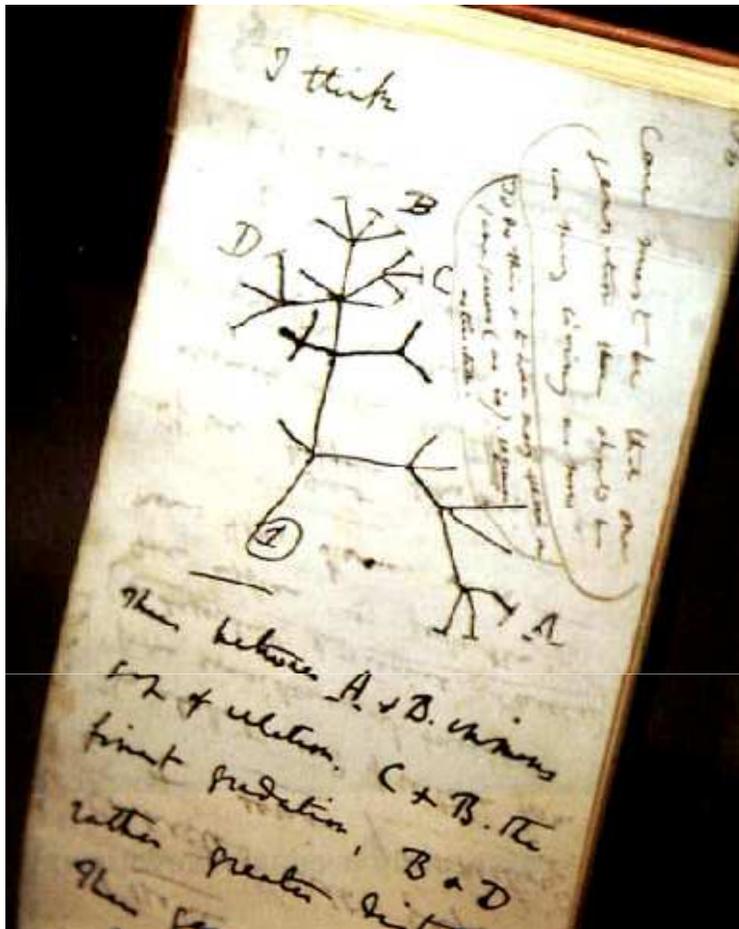
**Hominoid relationships.** Schematic representation of the inferred evolutionary relationships between Miocene apes, early hominins, and extant hominoids. Solid gray bars represent the known time range of each genus, thin dark lines are inferred relationships between the genera, and thin dashed lines with “?” denote uncertain relationships.

Terry Harrison , *Apes Among the Tangled Branches of Human Origins*, Science 2010: Vol. 327. no. 5965, pp. 532 – 534.

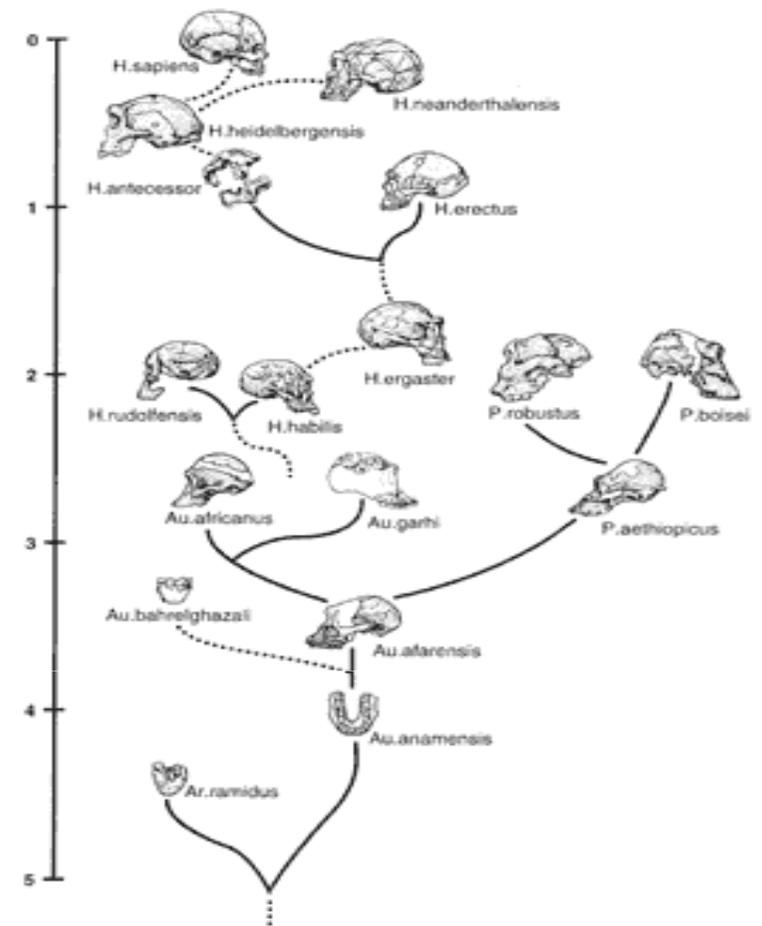


Il corallo dell'evoluzione umana

7 MILLION YEARS AGO (MYA)

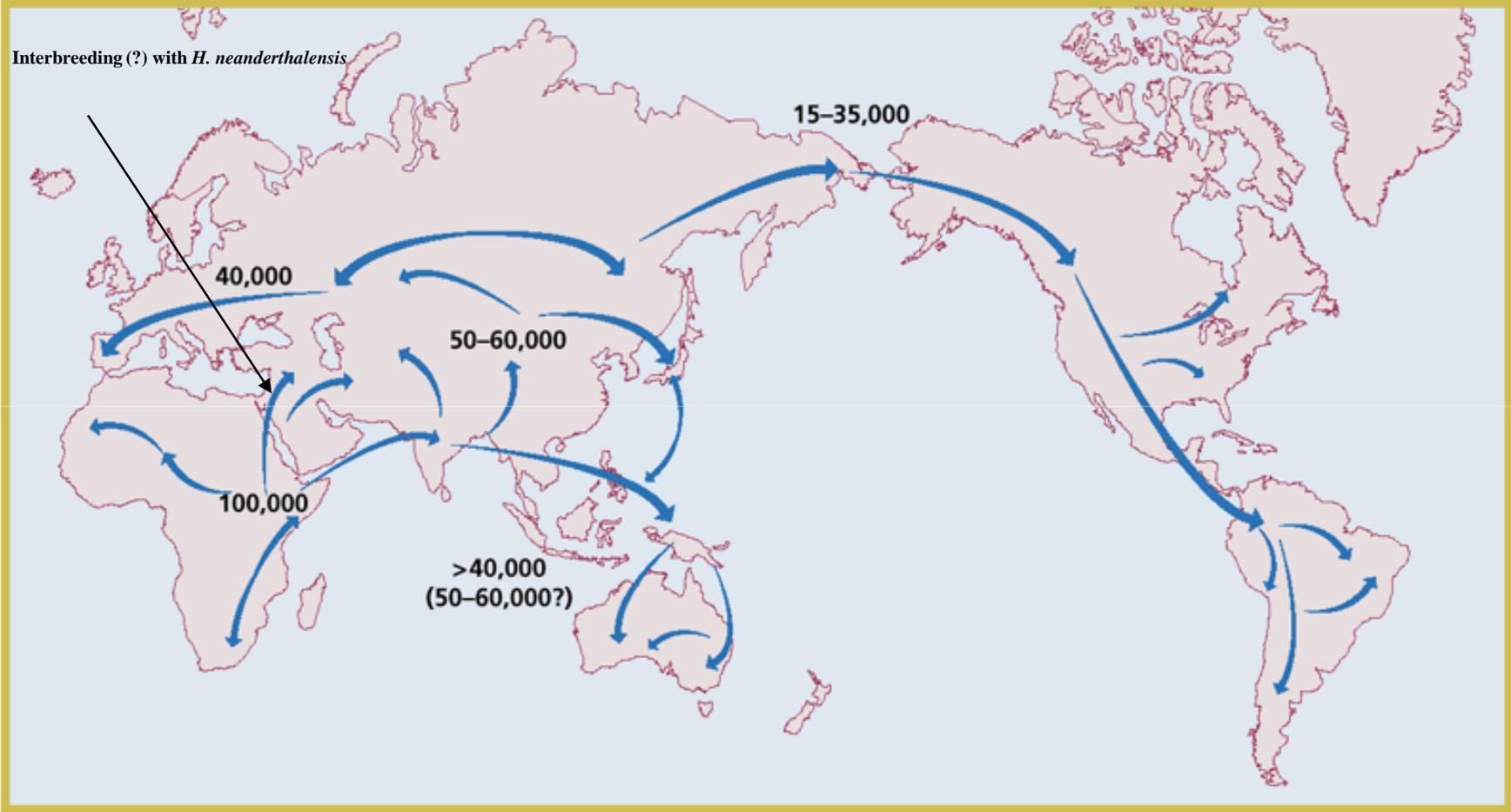


Notebook B, July 1837



L'albero cespuglioso degli ominini, 2010

# HOMO SAPIENS GLOBALIZATION



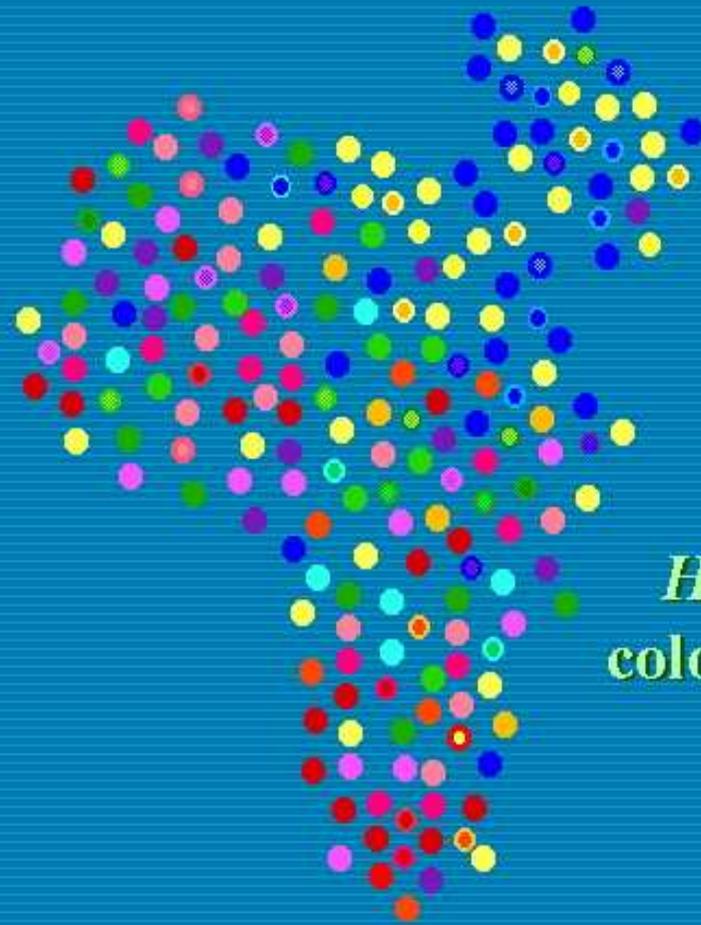
Tutti parenti, tutti differenti

*Early Homo sapiens sapiens*  
in Africa

150,000 to 100,000 BP



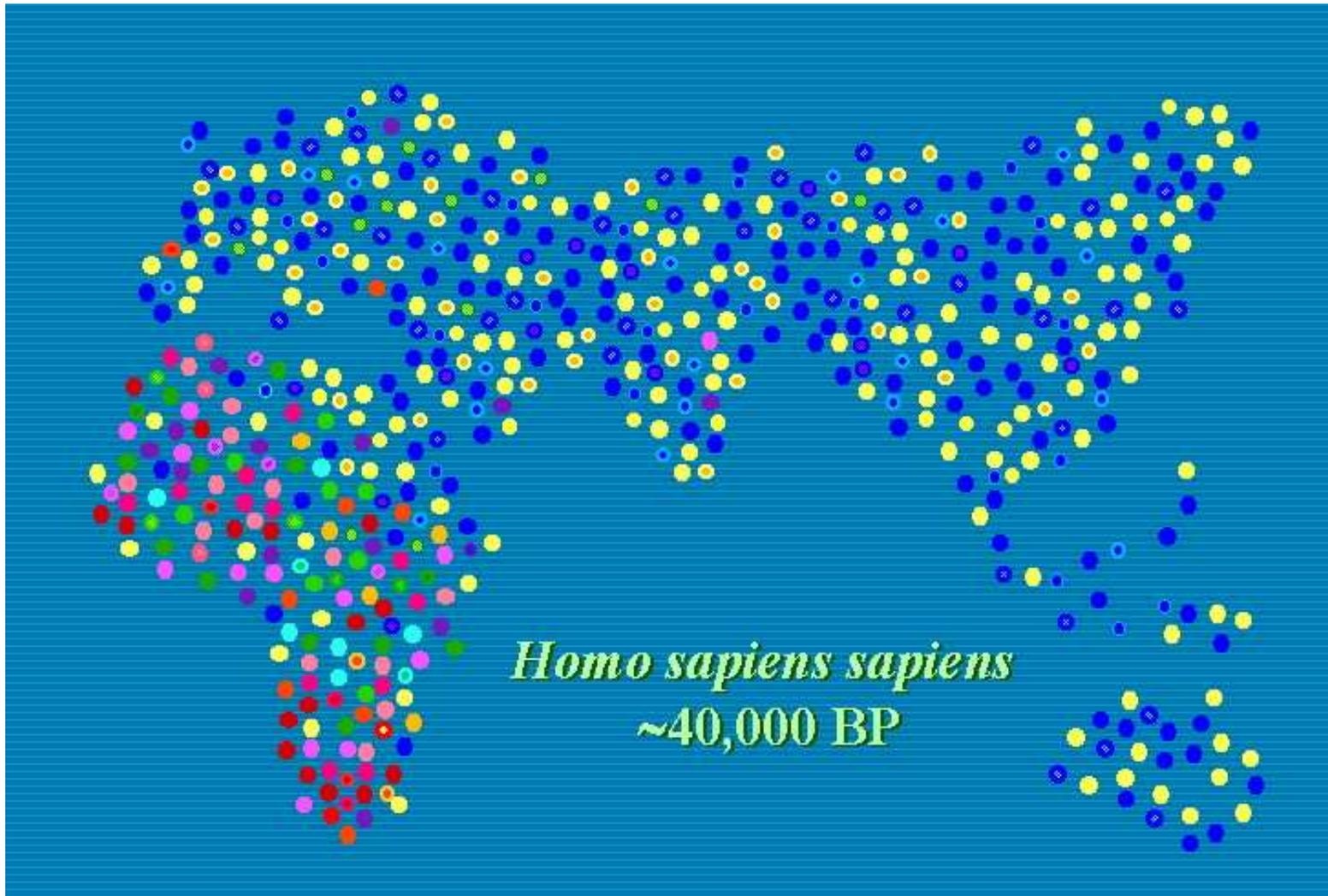
(courtesy, Kenneth Kidd, Yale University)



*Homo sapiens sapiens*  
colonizing south west Asia

~100,000 BP

(courtesy, Kenneth Kidd, Yale University)



(courtesy, Kenneth Kidd, Yale University)

**riflessioni conclusive:**

**sara' corretta la nostra insistenza  
su "modelli unificati"?**

**quale e' il motore principale di questa  
nostra insistenza?  
osservazioni o pregiudizi?**