

Postempirical Physics?

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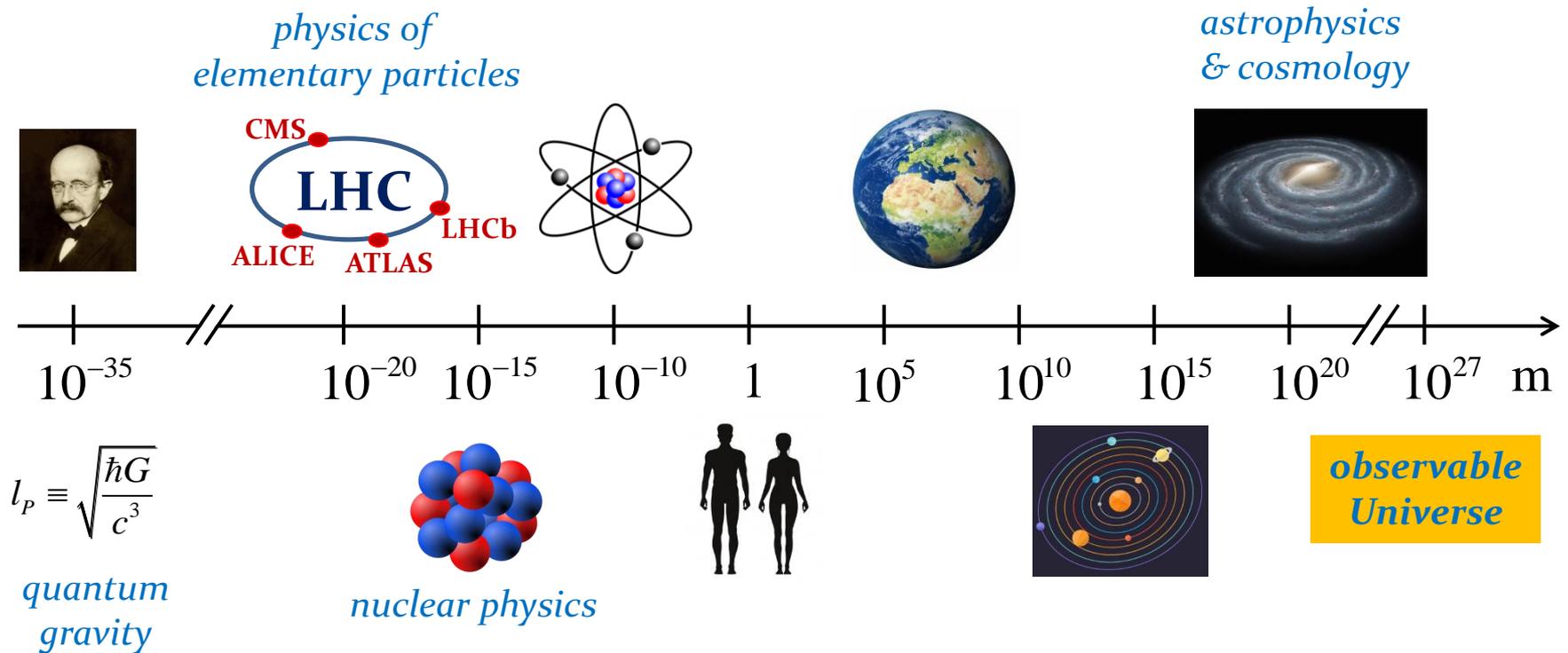


The experimanalist

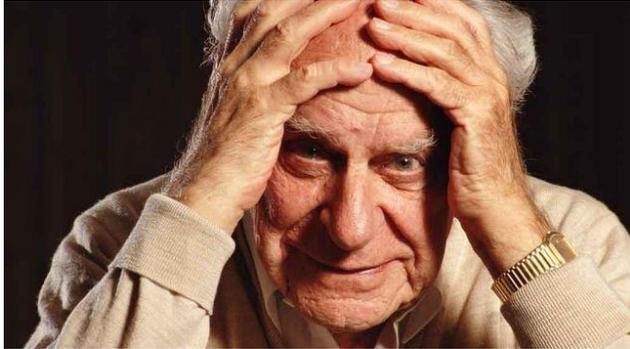
Happy Birthday!



Unprecedented success of physics of 20th century



Falsifiability – a pillar of physics

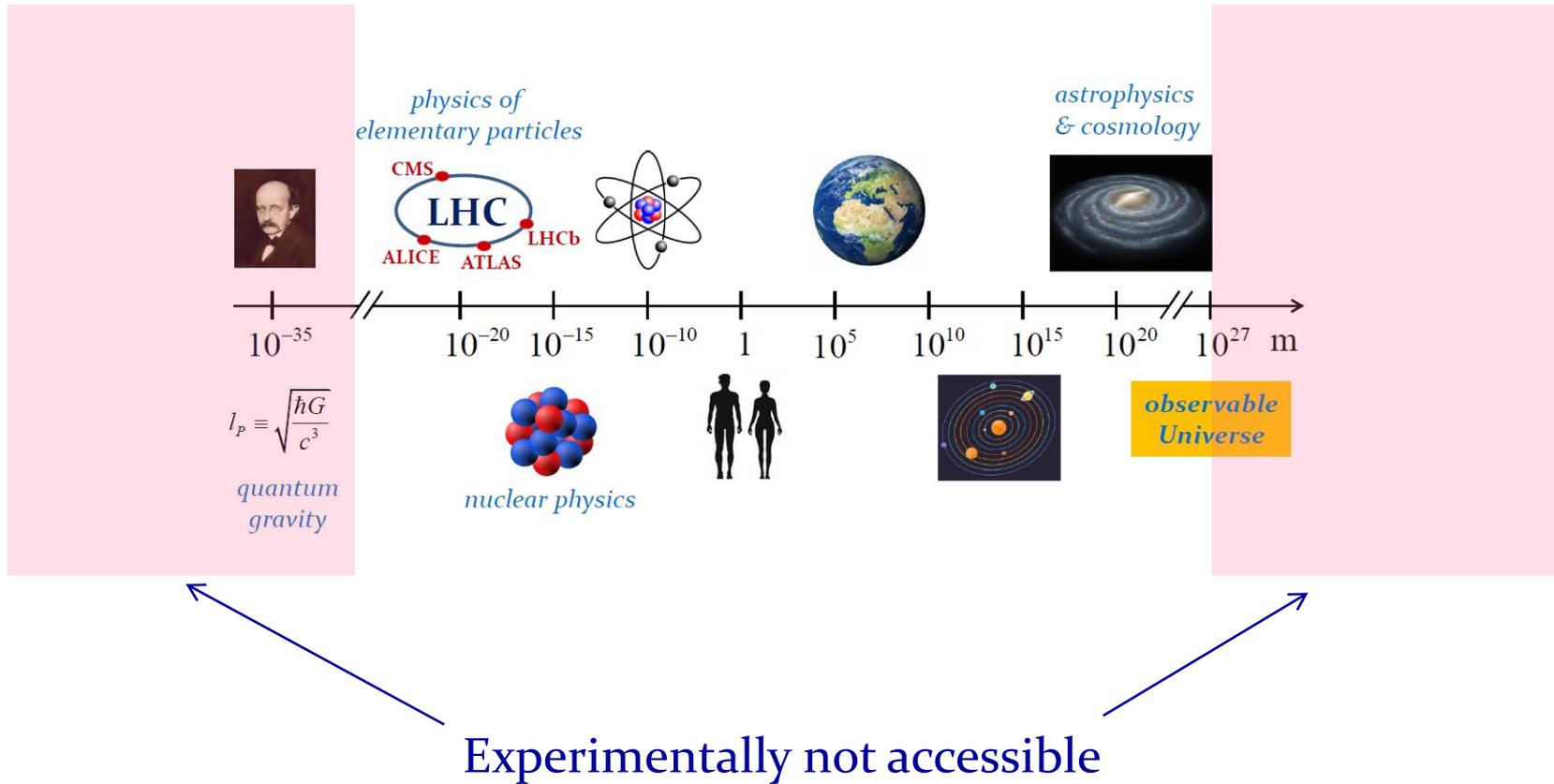


Karl Popper 1902-1994

A theory is scientific only if it is possible to establish that it is false!

*Scientific theories are never finally confirmed,
but incrementally corroborated through
the absence of disconfirming evidence
in a number of well-designed experiments.*

Thechnological limits of empiricism



Quantum gravity

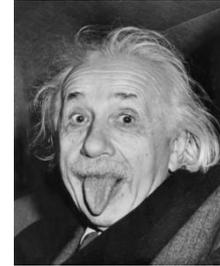
$$l_P \equiv \sqrt{\frac{\hbar G}{c^3}} = 10^{-35} \text{ m}$$

string
theory?

loop
gravity?

supergravity ?

$$m_P \equiv \sqrt{\frac{\hbar c}{G}} = 10^{19} \text{ GeV}/c^2$$



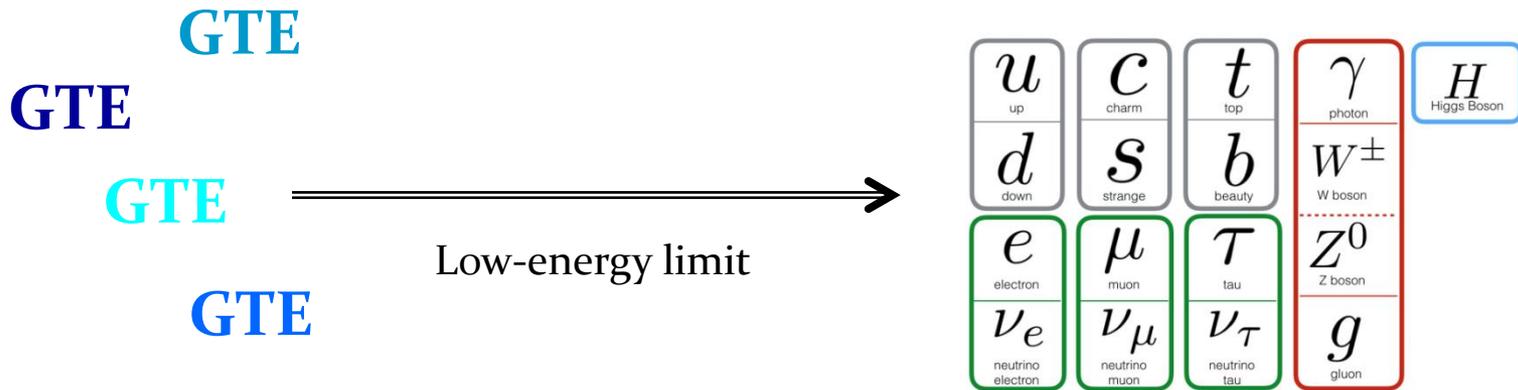
classical gravity

classical limit

$$R^{\mu\nu} - \frac{1}{2} R g^{\mu\nu} + \Lambda g^{\mu\nu} = \frac{8\pi G}{c^4} T^{\mu\nu}$$

General Theories of Everything

No physics beyond SM observed @ LHC



Fundamental limits of empiricism

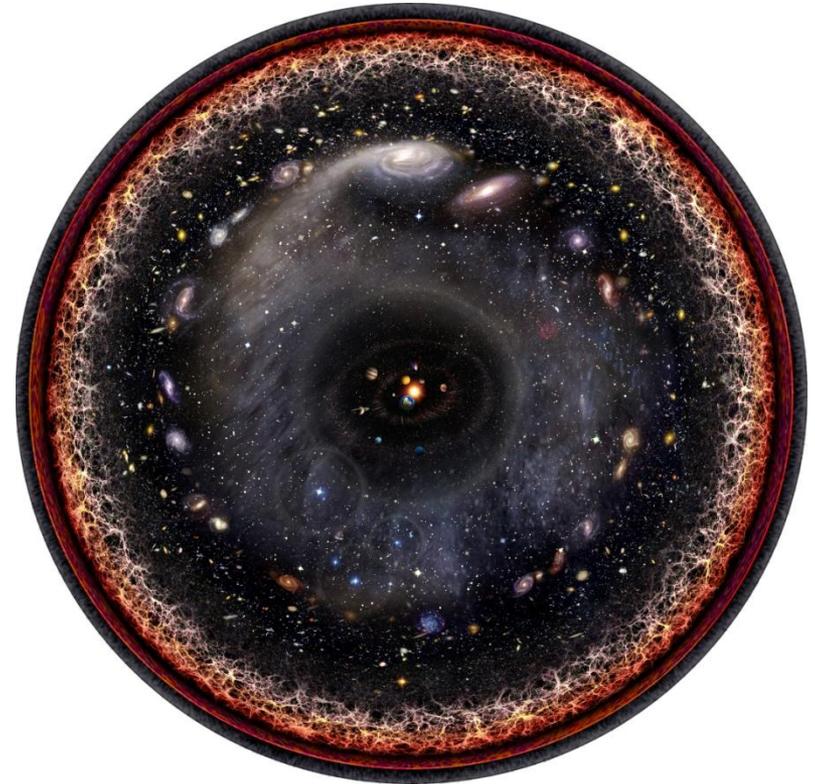
Cosmology

Cosmological principle

The observable part of the Universe is typical, representative of the whole.

Cosmological hypothesis

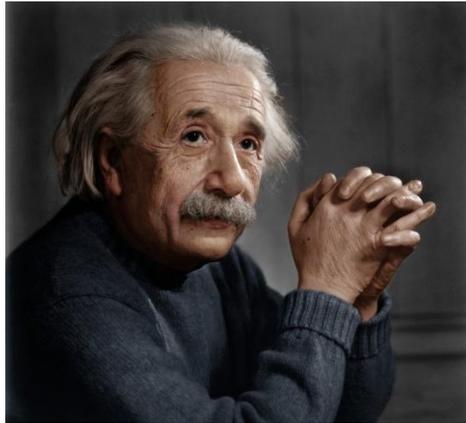
The laws of physics are the same, in any place and any time.



Log-scale image by Pablo Carlos Budassi

More questions, more speculations

From how? to why?

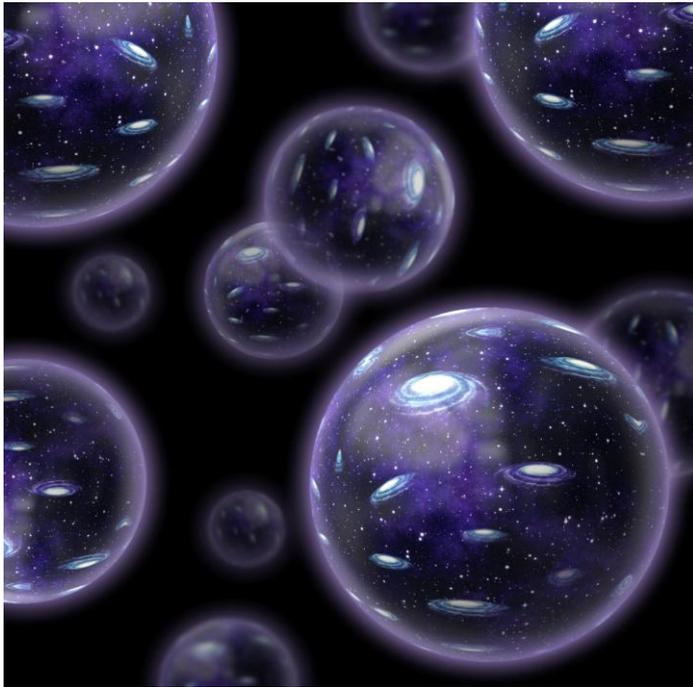


Had God any choice in the creation of the World?

Interesting question but experimentally inaccessible

Multiverse

From inflationary cosmological model to multiverse



Andrei Linde

Causally disconnected
Universes

Is it still physics?

If not experiment then what?

Cartesian rationalism?



René Descartes (1596-1650)

Example of quantum gravity

$$l_p \equiv \sqrt{\frac{\hbar G}{c^3}} = 10^{-35} \text{ m}$$

string
theory?

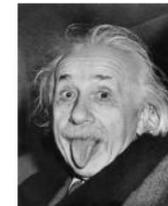
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classical limit



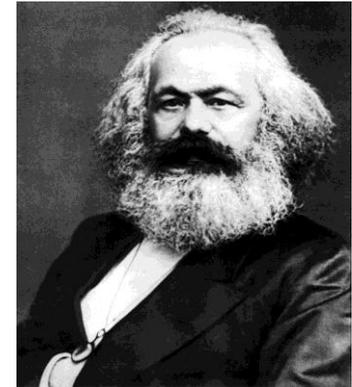
classical gravity

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Epilogue

Breakthrough Prize in Fundamental Physics (\$3 million) awarded to discoverers of **Supergravity** S. Ferrara, D. Freedman and P. van Nieuwenhuizen

Supergravity is not a theory of nature.



A spectre is haunting Physics

– the spectre of post-empiricism.