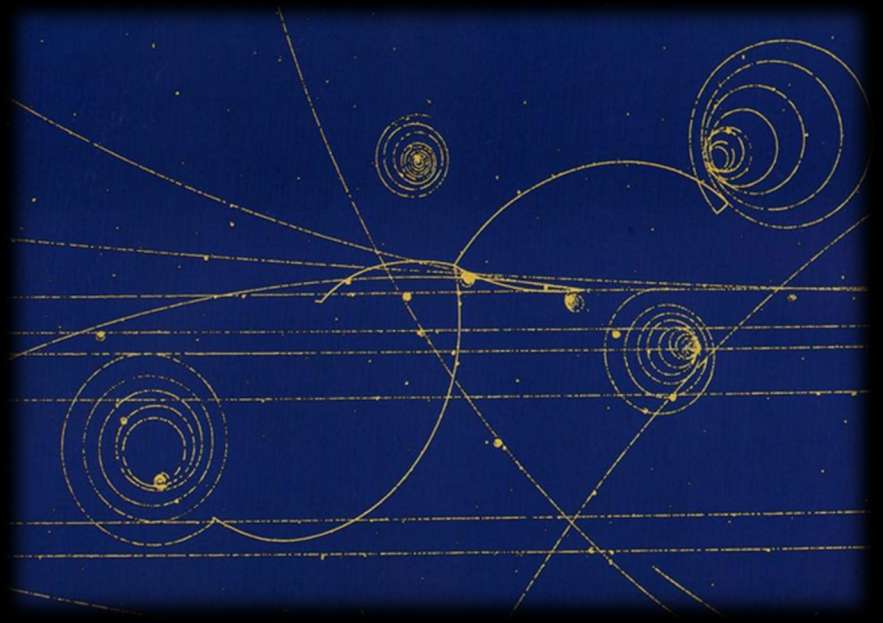
From Particle Physics to Cosmology

Michel GONIN, ILANCE
Tomotake MATSUMURA, IPMU

CNRS-JSPS-JST
Celebration Event for the
50th
Anniversary
of France-Japan
Scientific Cooperation

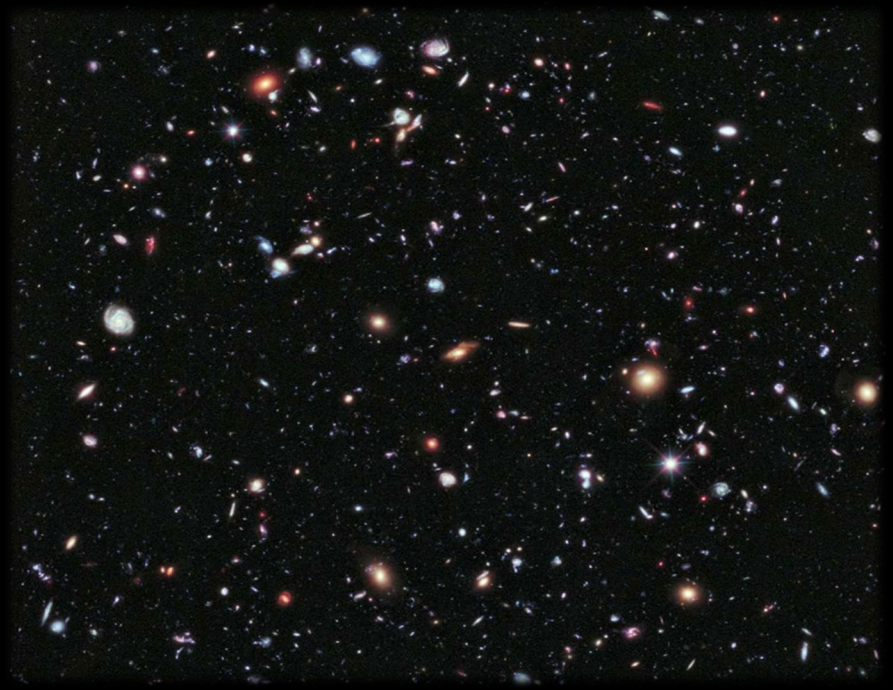


LHC Programs, Masaya Ishino, ICEPP

Neutrinos Programs, Benjamin Quilain, ILANCE

Cosmology Programs - Cosmic Microwave Background, Guillaume Patanchon, ILANCE

Astrophysics Programs, Kotaro Kohno, IoA



Telescope Array, Hitoshi Oshima, ICRR

Cherenkov Telescope Array Observatory, Shotaro Abe, ICRR

Machine Learning, Christine Quach, ILANCE

BELLE II, Fumiaki Otani, IPMU

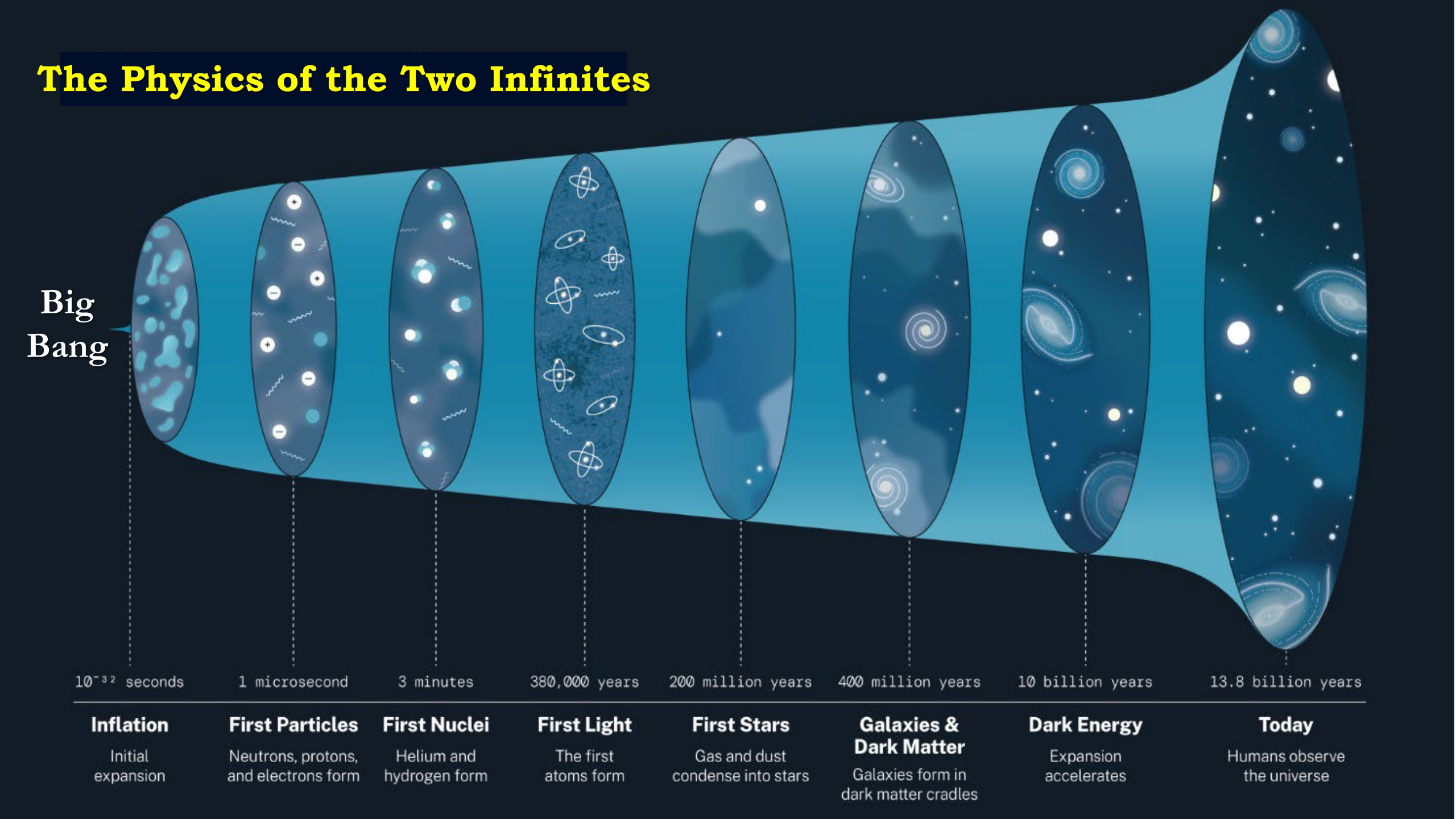
LiteBird, Clement Leloup, IPMU

Cosmology from HSC, Jessica Cowell, IPMU

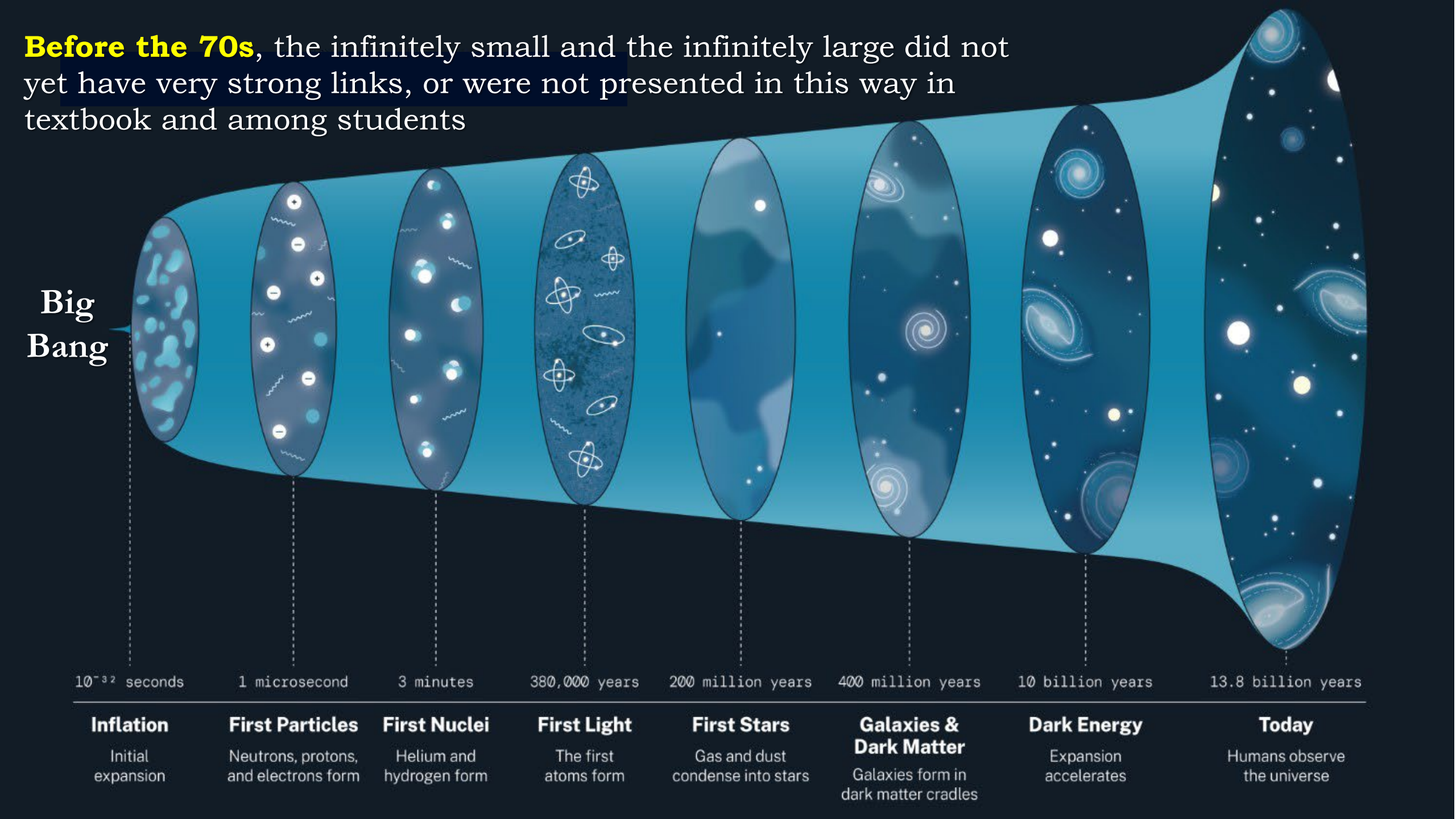
Super-Kamiokande, Lorenzo Périssé, ILANCE

TIFUUN, Kanako Narita, IoA

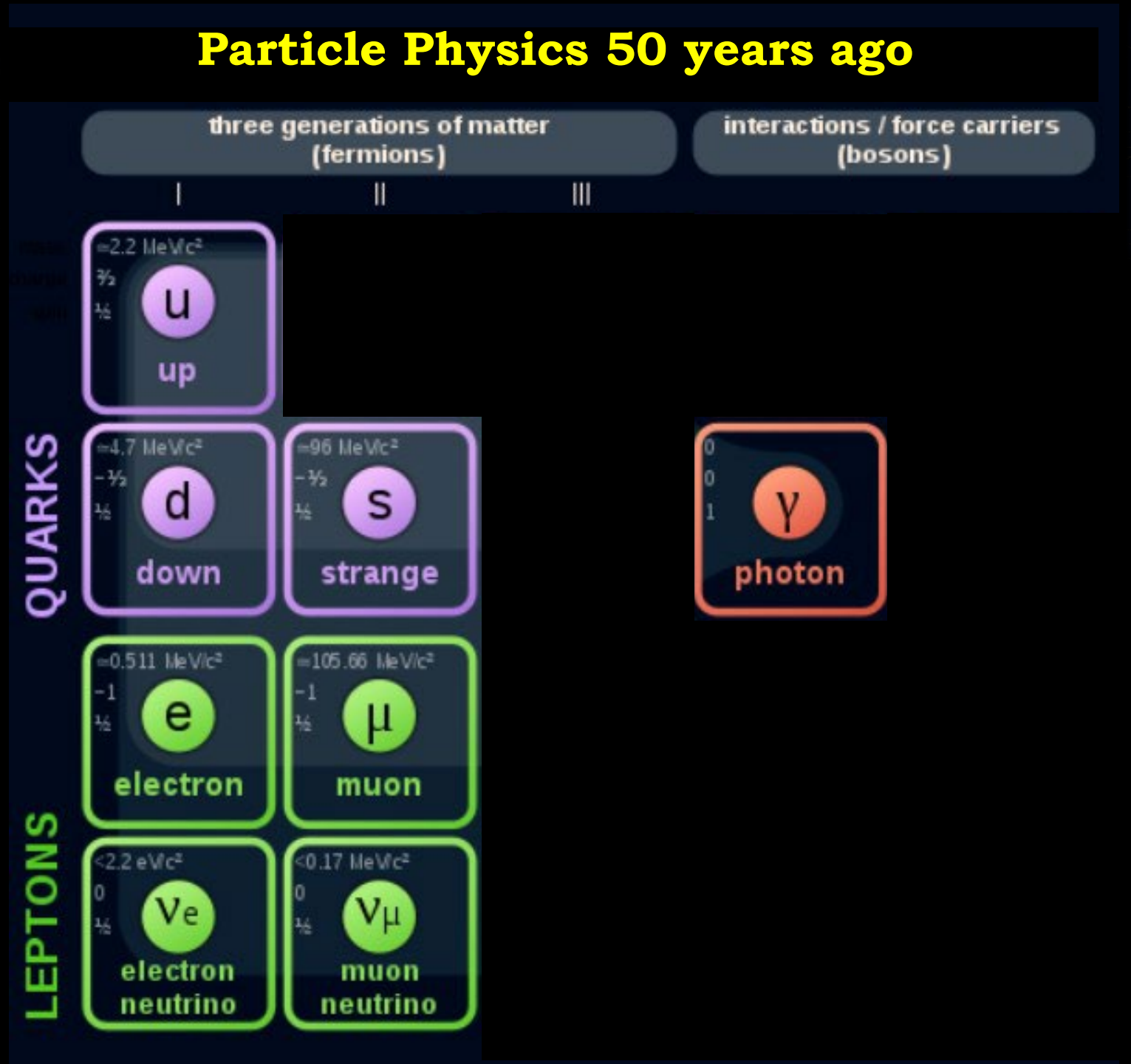
The Physics of the Two Infinites



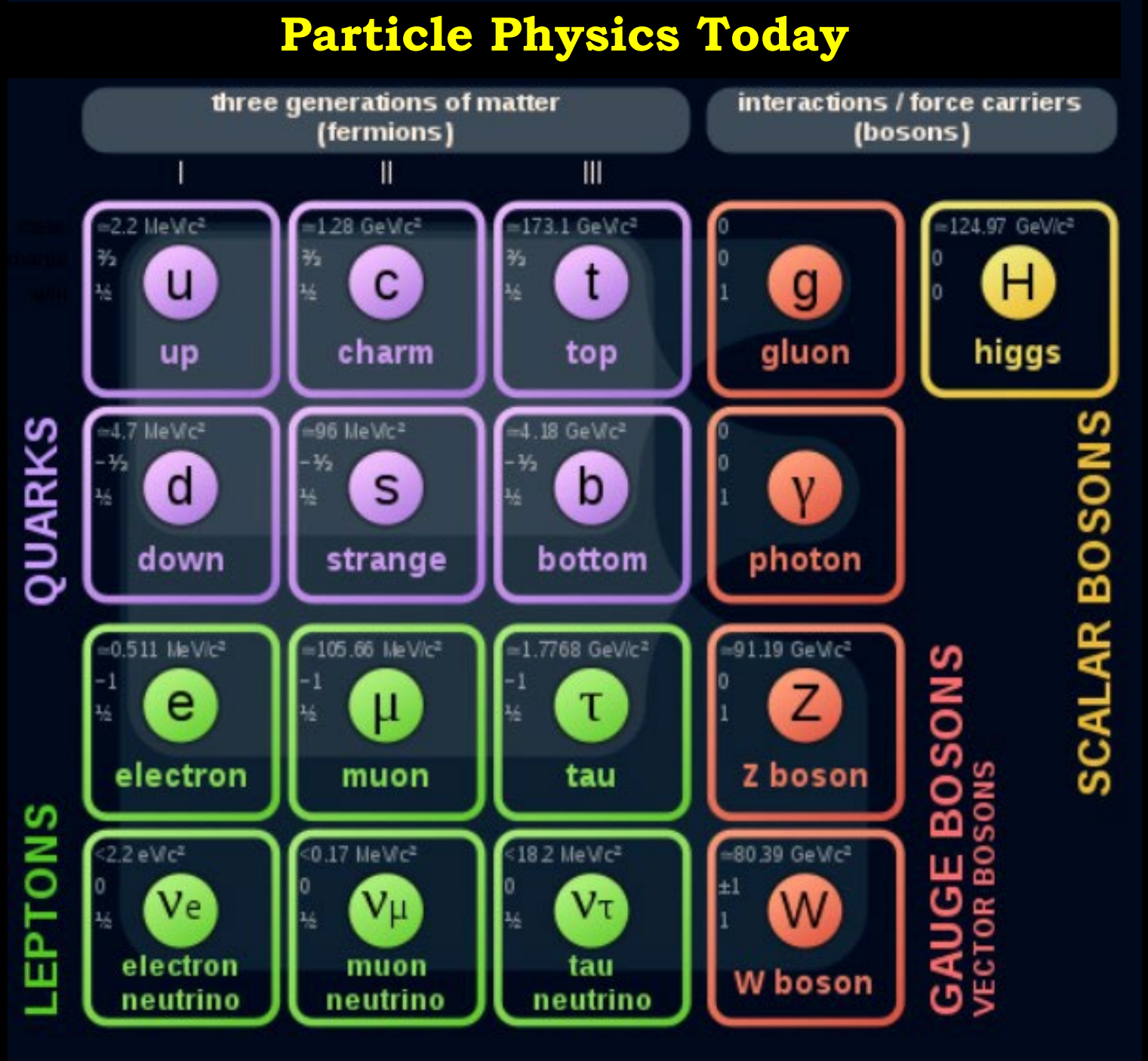
Before the 70s, the infinitely small and the infinitely large did not yet have very strong links, or were not presented in this way in textbook and among students



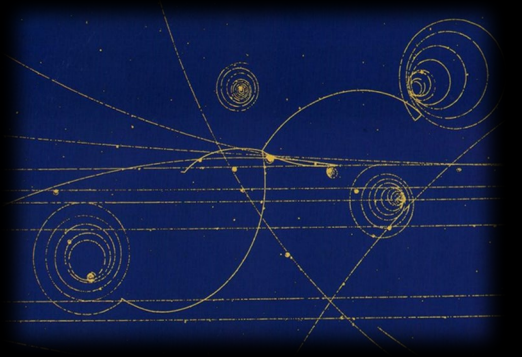
Particle Physics 50 years ago

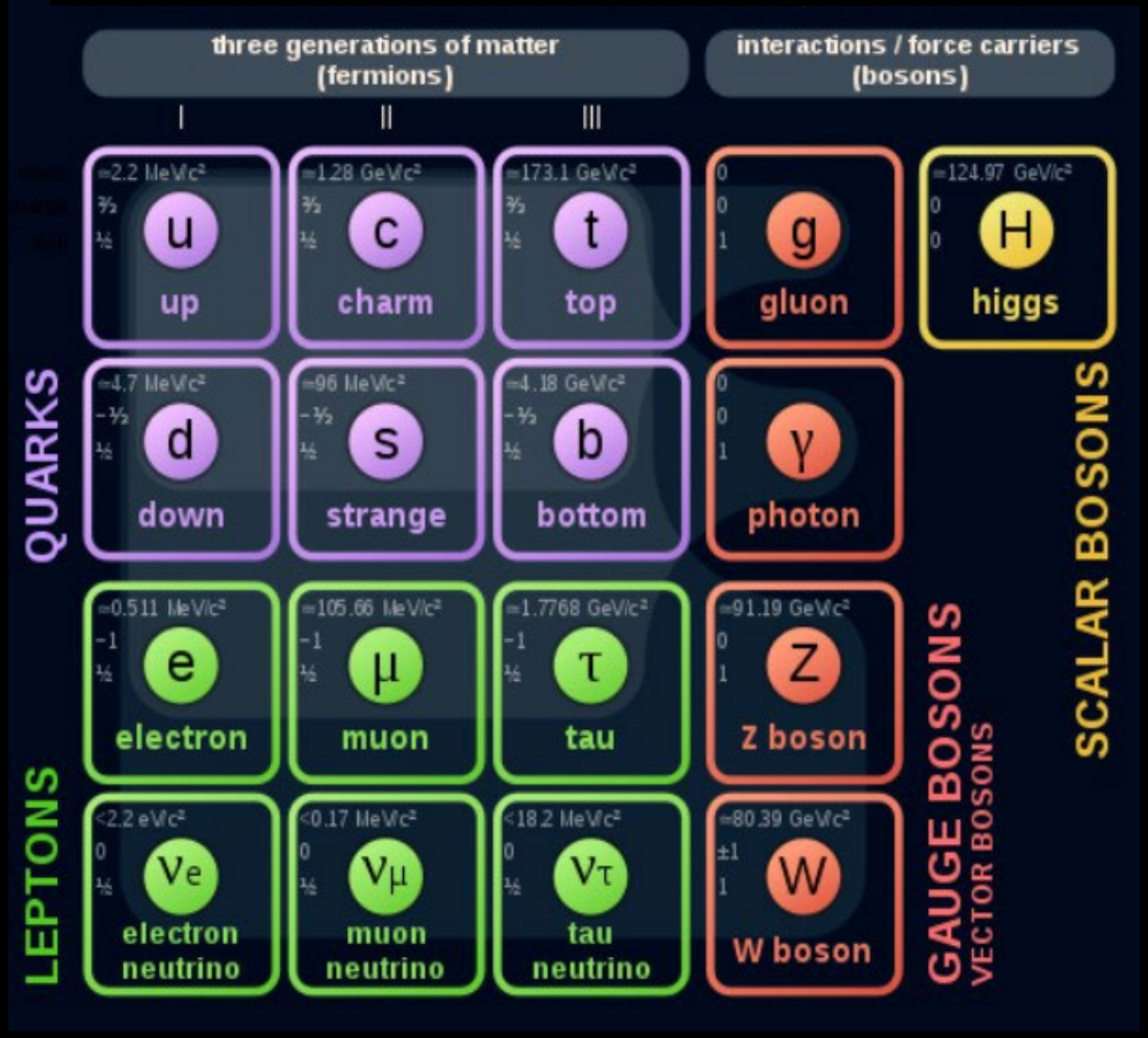


Particle Physics Today



The Standard Model in Particle Physics Today





- **Dark Matter (Wimps, Machos, …)**
- **Higgs boson and Cosmology (Inflation, Dark Matter, ….)**
- **Neutrinos and Cosmology (Nucleosynthesis, Leptogenesis, …)**
- **Antimatter in our Universe (CP Symmetry)**

Cosmology and Astrophysics 50 years ago

Before 1920s The Universe was static, without any “history”

1927-1929 Discovery of the expansion of the Universe, Galaxies

1930s First Big Bang models

1930s Cosmic rays

1950s Stellar nucleosynthesis

1950s The abundance of the elements in the Universe

1960s Cosmic Microwave Background CMB radiation

1970s Dark Matter

Progress in Cosmology and Astrophysics over the last 50th years

- CMB measurements
- Supernovae
- Neutron stars
- Standard model of cosmology
- Black Holes
- Dark Energy
- Inflation theory
- Large-scale structure of the cosmos
- Galaxy formation
- High energy gamma ray sources
- Gravitational waves

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Many France-Japan collaborations have contributed to the physics of the two infinities over the last 50 years

And this will continue with new projects !