



Multilateralism Approach in Neutrino Physics sociology

Michel Spiro

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Neutrino history, APC, Paris

Neutrino sociology: outline



- Neutrino multilateralism is an alliance of multiple “groups” pursuing a common goal
- Neutrino scepticism.

Multilateralism (1): Neutrino Properties

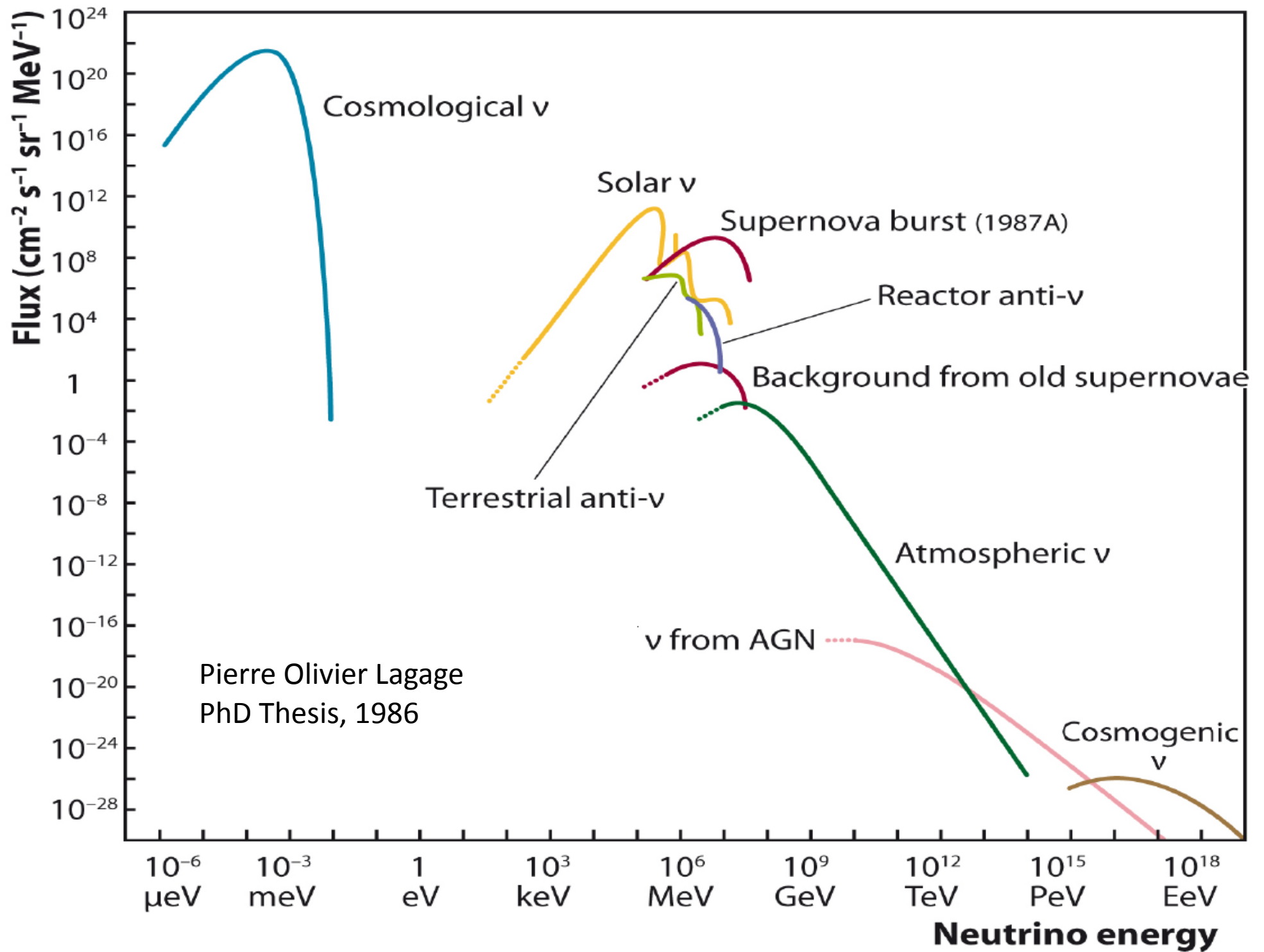
- Interactions \rightarrow cross sections
- Propagation \rightarrow oscillations
- Masses
- Dirac or Majorana
- CP violation
- Role in cosmology
- Species



Multilateralism (2): Neutrino Sources

- Natural, artificial sources
- Reactor
- Accelerator
- Atmospheric
- Solar
- Supernovae
- Cosmic (blazars..)
- Cosmological
- Geo neutrinos





Multilateralism (3): Neutrino Detectors

- Beta decay spectrometers
- Large underground detectors
- Radiochemical experiments
- Large under sea detectors
- Large under ice detectors
- Balloon and space experiments
- Short and long baseline accelerator neutrino detectors
- Missing energy hermetic detectors



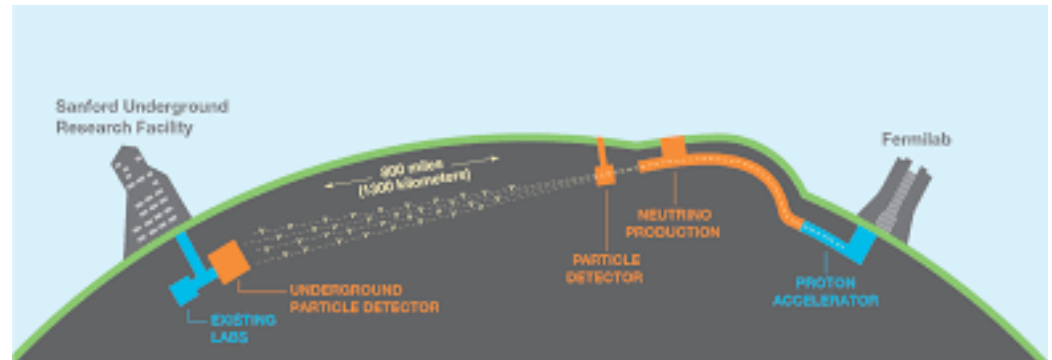
Multilateralism (4): Neutrino Collaborations



- From few people to one thousand collaborators
- Most are international, even small experiments (neutrino for peace also)
- In general a steadily growing community

Multilateralism (5): Applications

- Neutrino astronomy
- Neutrino cosmology
- Earth tomography
- Geosciences
- Reactor monitoring
- Non proliferation of nuclear weapons



Multilateralism (6): Common goal and Coherent Strategy

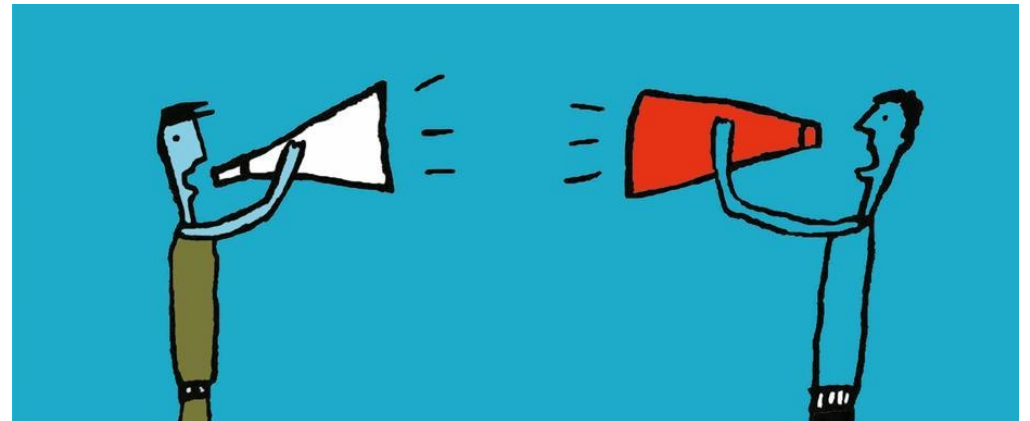
Despite fragmentation (neutrino properties x type of neutrino sources x type of detectors x collaborations) the community developed (it took some time) a coherent strategy:

- AppEC
- P5 US
- ACFA
- IUPAP Neutrino conferences
- IUPAP neutrino panel



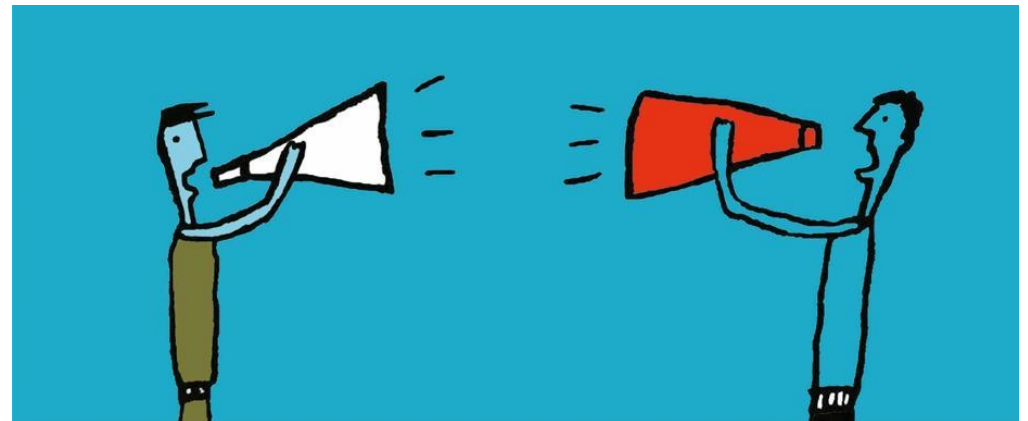
Multilateralism (7): A world of controversies

- Neutrino working hypothesis at the beginning
- Neutrino discovery
- Neutral currents
- Solar neutrino deficit
- Atmospheric neutrino deficit
- Masses
- Fancy properties
- ...



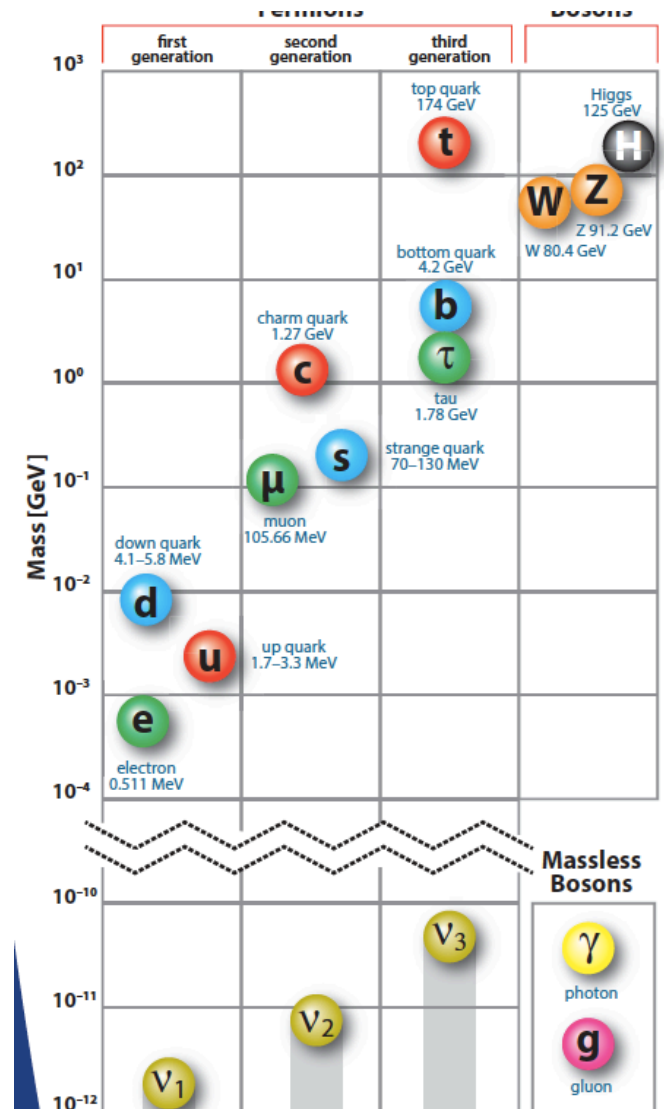
Multilateralism (7): A world of controversies

- Many working hypotheses
- Mistakes
- Serendipity
- Discoveries



Neutrinos nourish “Scepticism” (1): Normal scepticism

- First evidences of neutrino oscillations were sometimes taken with great scepticism.
- Are neutrinos traveling faster than the speed of light?
- Are neutrino properties an evidence of Physics beyond the Standard Model?
- Sterile Neutrinos



Neutrinos nourish “Scepticism” (2): A priori scepticism

- Solar neutrino deficit
- Neutrino oscillations scepticism ranged from normal to systematics
- It will never work



Neutrinos nourish “Scepticism” (2): irrational (fake news)

- Be prepared to be exposed to fake news like:



“Neutrinos are an invention of scientists, relayed by the media for their own benefit”

“neutrinos have been proven to be a canard repeatedly over and over again”

“why wasting so much money on neutrino activities? We will never learn!”

“neutrinos are based on faulty science and manipulated data”

“the concept of neutrino oscillations has been created by and for the Japanese to make US non competitive”

Any reminiscence of tweets is not fortuitous

Conclusions



- A community full of diversity, imagination, boldness,
- A rich history (see this conference)
- Now well recognized (9 Nobel Prizes!)
- A field which make many others envious of its richness
- Let's hope that the next decades will be as enjoyable as the previous ones.
- **THANK YOU AND THANKS TO THE ORGANIZERS!**