



# Scientific diffusions



# Outlook of Fellini outcomes

## Conferences and seminars

- G. Benato, [CNNP 2020](#)
- G. Benato, [SnowMass workshop](#)
- G. Benato, [Seminar @ CEA \(FR\)](#)
- M. Lamoureux, [KM3NeT Town Hall Meeting 2019](#)
- M. Lamoureux, [Neutrino 2020](#) (poster)
- M. Lamoureux, [Cosmic Rays and Neutrinos workshop](#) (poster)
- M. Lamoureux, [Neutrino Telescope 2021](#)
- S. Gariazzo, [Neutrino Telescopes 2021](#)
- S. Gariazzo, [seminar at Birmingham U.](#)

## Other scientific outcomes

- S. Gariazzo: [FortEPiANO](#) (code for neutrino oscillations in the early universe, to be published as soon as the paper Bennett et al. is accepted for publication)
- S. Gariazzo: [PARthENoPE 3.0](#) (code for BBN abundances, paper to be submitted soon to arXiv)

## Publications

- M. Lamoureux: Al Kharusi et al. [SNEWS 2.0: A Next-Generation SuperNova Early Warning System for Multi-messenger Astronomy.](#)
- M. Lamoureux: Super-Kamiokande collaboration. Search for neutrinos in coincidence with Gravitational Wave events from the LIGO-Virgo O3a Observing Run with the Super-Kamiokande detector. Soon on arXiv...
- S. Gariazzo: de Salas et al. [2020 Global reassessment of the neutrino oscillation picture](#)
- S. Gariazzo: Archidiacono et al. [Sterile neutrino self-interactions:  \$H\_0\$  tension and short-baseline anomalies](#)
- S. Gariazzo: Vagnozzi et al. [Listening to the BOSS: the galaxy power spectrum take on spatial curvature and cosmic concordance](#)
- S. Gariazzo: Bennett et al. [Towards a precision calculation of  \$N\_{\text{eff}}\$  in the Standard Model II: Neutrino decoupling in the presence of flavour oscillations and finite-temperature QED](#)
- S. Gariazzo: Gariazzo et al. PARthENoPE revolutions. Soon on arXiv...
- G. Benato: CUORE collaboration, [Improved limit on neutrinoless double-beta decay in  \$^{130}\text{Te}\$  with CUORE](#)
- G. Benato: CUPID-Mo collaboration, [A new limit for neutrinoless double-beta decay of  \$^{100}\text{Mo}\$  from the CUPID-Mo experiment](#)
- G. Benato: CUPID collaboration, [Characterization of cubic  \$\text{Li}\_2^{100}\text{MoO}\_4\$  crystals for the CUPID experiment](#)
- G. Benato: M. Agostini et al., [Constraints on the mass of Majorana neutrinos from Cosmology](#)
- G. Benato with M. Agostini, J. Detwiler, J. Menendez and F. Vissani, review paper on  $0\nu\beta\beta$  decay in preparation for Rev. Mod. Phys. (expected Aug. 2021)

# Outreach activities

## Divulcation events

- G. Benato, Sharper 2020 L'Aquila  
[Tutto quello che avreste voluto sapere sulla scienza al Gran Sasso... \(ma non avete mai osato chiedere\)](#)
- G. Benato International Cosmic Day 2020  
[Online event with high school students](#)
- M. Lamoureux, VenetoNight - [Notte dei Ricercatori 2020 - In visita ai grandi esperimenti di fisica](#)

## Long-term projects

- S. Gariazzo: working on some divulgation articles and on the texts for a **divulgation book**, in collaboration with P. F. de Salas (poems) and I. Maturana (illustrations)
- G. Benato: member of the [Asimov Prize](#) scientific commission



# Conclusion



# Impact and future projects

## Secondment plans

- M. Lamoureux @ APC - Paris (May 2021 - March 2022)
- G. Benato @ CEA - Paris (Dec. 2021 - ? )
- S. Gariazzo @ Chile (2022?)

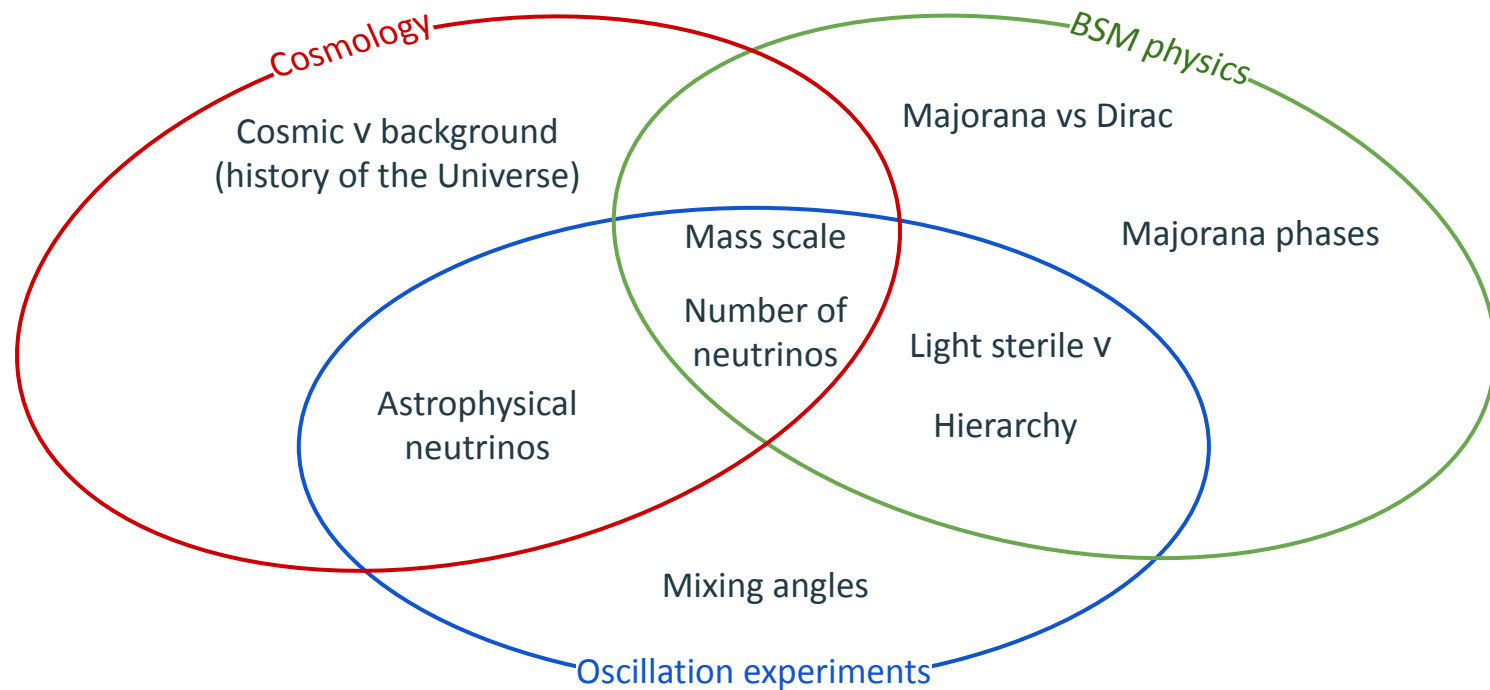
## Impact of Fellini projects

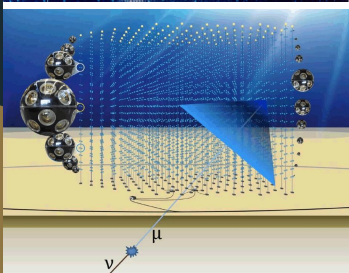
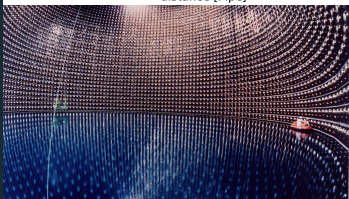
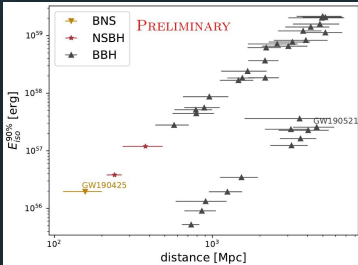
- Instigation of Multimessenger Neutrino Astronomy efforts within Super-K/Hyper-K by M. Lamoureux
- MC simulation work by G. Benato is fundamental for the design of the CUPID experiment
- Global analysis of oscillation data by S. Gariazzo is the reference in the field

## Future projects

- M. Lamoureux: extend follow-ups beyond gravitational waves and initiate joint analysis between collaborations
- G. Benato: expand the bolometric  $\alpha$  detector to a screening facility for all low-background experiments
- S. Gariazzo: use machine learning techniques for improving global analyses of neutrino oscillation data

# Addressing neutrino questions



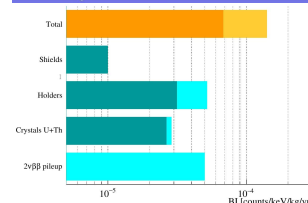
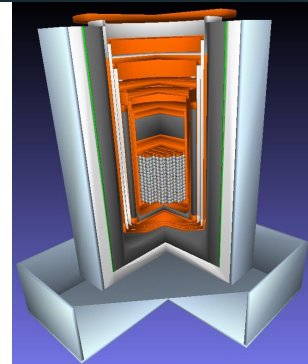


## M. Lamoureux

- v+GW coincidence analysis
- Limit on total  $\nu$  emissions
- Prospects: combine SK with ANTARES

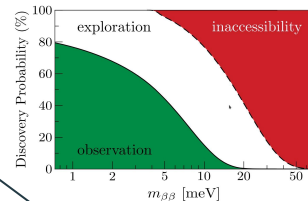
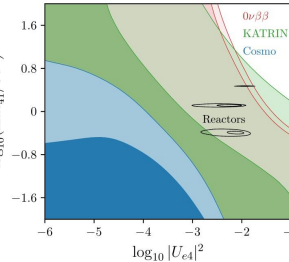
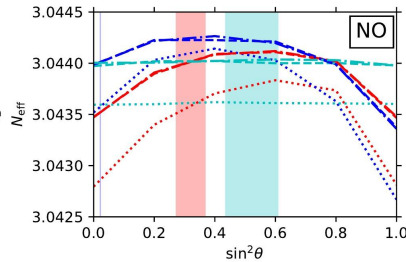
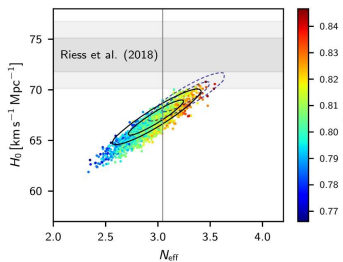
## G. Benato

- Optimization of CUPID design
- Screening of  $\alpha$  contaminants
- Global  $0\nu\beta\beta$  analyses



## S. Gariazzo

- Cosmic  $\nu$  background
- Precision values for 3 known  $\nu$  parameters
- Global analysis for sterile  $\nu$



# Open questions in neutrino physics

- ❖ What is the nature of neutrino? Dirac or Majorana?
- ❖ What is the absolute mass scale? And the mass hierarchy?
- ❖ Are there hidden symmetries in their mixings?
- ❖ What are their impact in the Early Universe and in cosmology? Baryon asymmetry?
- ❖ Does the light sterile neutrino exist? Are there heavy neutrinos?
- ❖ What are the astrophysical neutrino sources? How do they participate in SNe explosions?