The 27^{th} International workshop "What comes beyond the standard models?" :

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The series of workshops "What comes beyond the standard models?" started in 1998 with the idea of organising the workshops in which participants would spend most of the time in discussions, confronting different approaches and ideas.
The picturesque town of Bled by the lake of the same name, surrounded by beautiful mountains and offering pleasant walks, was chosen to stimulate the discussions.

The idea was successful and has developed into an annual workshop, which is taking place every year since 1998. Very open-minded and fruitful discussions have become the trademark of our workshops, producing several published works. It took place in the house of Plemelj, which belongs to the Society of Mathematicians, Physicists and Astronomers of Slovenia.

The workshops at Bled changed after the Covid pandemic: For two years, the workshop became almost virtual and correspondingly less open-minded. The discussions, which before asked the speaker to explain and prove each step, can not be done so easily virtually. However, many questions still interrupt the presentations, so that the speakers must often continue their talks several times in the following days. Also, this year, all the talks will be presented virtually.

The organizers hope very much that the Zoom participants will interrupt each presentation when cannot understand the speaker, and hope that the speakers will enjoy questions.

In the last 26 workshops we discussed the open questions in the elementary particle physics and cosmology, like:

- Can the Dirac's second quantization postulates for fermion and boson fields be explained
  - with a finite number of Clifford odd and even "basis vectors" describing the internal space of fermions and bosons and with the continuous infinite basis in ordinary momentum or coordinate space?
- Can the need for the Fadeev-Popov ghosts in Feynman's diagrams be explained by the Clifford odd and even "basis vectors" in odd-dimensional spaces?
- Are the Kaluza-Klein-like theories, with gravity as the only interaction among fermions in higher dimensional spaces, the right next step to understand
  - all the observed properties of quarks and leptons and antiquarks and antileptons, and
  - of their vector and scalar gauge vector fields?

- What is the most promising step beyond the standard model, explaining the assumptions of the standard model like:
  - the origin of massless family members with their related spins and charges,
  - the origin of families of fermions,
  - the origin of massless vector gauge fields,
  - the origin of the Higgs' scalar and Yukawa couplings for massive quarks and leptons,
  - the origin of differences in masses of family members?
- What is the most promising step beyond the standard model explaining:
  - the origin of dark matter and its properties (when comparing cosmological observation, direct detections and all the proposed models),

* the masses and charges of the dark matter,
* the origin of the dark energy,
* the origin of ordinary matter-antimatter asymmetry.

o o What is the dynamics of the dark matter in in our solar system?

o How to interpret the so far made searches for new physics?

* How many families shall we be able to observe at the LHC and at which energies?
* How many scalar fields shall the LHC observe?

- What is the origin of the energy scales:
  - the colour phase transition scale,
  - the electroweak phase transition scale,
  - the scale at 10^{19} GeV or higher?
- What can strings and membranes contribute to our understanding of elementary particle physics and cosmology,
  - what understanding of the low energy fermions and the vector and scalar gauge fields they offer?

o Why has Nature made a choice of four (noticeable) dimensions while all the others (if existing) are hidden?

* What is the starting symmetry and starting dimension of our universe? (3+1)?

* and how can one understand that we do not see the the dimensions larger then (3+1) if there were more?

* What are properties of space-time in the hidden dimensions?

* Can it be that dynamics in higher dimensions is just frozen out while internal spaces give properties to fields in $d = (3 + 2)$?

o How can all gauge fields, including gravity and scalar fields, be unified and quantized?

o What is the origin of the fields which caused inflation?

o What can new measurements of gravitational waves contribute to understanding cosmology (and elementary fields)?

o How can the second quantization of the black hole be related to classical singularity?

o How do black holes influence the history of the universe?

This year is the 27^{th} year in which we are discussing and proposing the answers to the above and many other open questions.
We understand nature better then we did before thanks to all experimental and theoretical observations.
We all are sure that what we do is important and helpful.
And we all know that even if the laws of nature are simple and elegant, the many body problem offer picturesque realizations.

The Organizers kindly ask the participants to ask so many questions as needed to clarify the meaning of the presentations.

The Organizers kindly ask the speaker to answer questions and enjoy answering so that participants can learn as much as we can.

Let us all enjoy our workshop although we are not at Bled.

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