Kick-off Workshop to Define HEP's Vision for the Future

Three major milestones are coming up in the near future for HEP division:
- Nominations for the Snowmass process are due mid-November 2019
- Our division has to present an outline for our future vision to DOE in March 2020
- The division will be reviewed by DOE HEP in June 2020

In order to prepare for these important events we will organize a divisional workshop in the first week of November 2019. Instead of thinking about each group's efforts individually, we aim to consider a set of overarching topics that will include groups across the division. These topics are future-oriented and we should explore how they can continue shaping the programs in our division as well as providing anchor points for the Snowmass process. We have identified topic leads for each area and would like the leads to gather input from across the division as they see fit and deliver a presentation of up to 50 minutes during the workshop, followed by a round of discussions.

We emphasize that this is a starting point of a longer process and we have not captured all of the opportunities as yet. It is also important to note that a number of current projects that are well in hand are not explicitly listed (ATLAS, g-2, Mu2e, SPT-3G, --) as the aim is mostly to focus on future developments.

Topics:

1. "AI for Science" and Computing across the Frontiers (Matt Becker, Andrew Hearin, Walter Hopkins, Yuri Oksuzian, Salman Habib)

The division has started an effort in this area already during the last year and formed the Advanced Computing Working Group (ACWG). In addition, PSE has started an AI effort in which HEP is playing an important role. This area is important across all three frontiers and is a source of major opportunities for our division within DOE, especially given the connection to CELS and the ALCF. We would like to hear about the progress the ACWG has made over the last year and a brief summary on the DOE wide town hall meetings. We want to discuss the next steps and understand how the division can best position itself for future opportunities in this area and build up the best possible connections within Argonne.

2. Effective Field Theory Approach to Physics Beyond the Standard Model (Jeremy Love, Peter Winter and the Theorists)

The hunt for particle physics beyond the Standard Model has become ever more challenging over the years. The traditional approach of investigating different decay channels might not lead to the desired results and is not an efficient way to explore the vast parameter space. More recently, the idea of using effective field theory approaches to search for hints of new physics in a more overarching way have gotten traction. We would like to explore opportunities in this area

for HEP division and gain a better understanding on how such an approach could lead to cross-frontier discoveries.

3. Detector R&D (Tom Cecil, Pete Barry, Bob Wagner, Tom Lecompte)

Detector R&D is a central topic for HEP experiments and cuts across all frontiers. The division is exploring ways to develop new directions in its program. Superconducting detector technologies are an important focal point with applications in CMB, dark matter detection, intensity mapping surveys and other areas including QIS. At least one other major direction needs to be identified -- one possibility is the proposed Q-Pix LAr TPC technology for the fourth DUNE detector. The Detector R&D Working Group should report on its activities in these areas.

4. Accelerator R&D (Harry Weerts, Rik Yoshida, Jimmy Proudfoot, John Power, Manoel Conde)

The next generation of high-energy physics experiments will pose a daunting challenge with respect to the needed energy reach. Research on advanced accelerator technology must play a major role in this endeavor. Next-generation light sources also need breakthrough accelerator technology. While Argonne's HEP division is well placed to deliver important advances, the field has to come together to coherently develop approaches at scale for the future. This will be particularly important with regard to the Snowmass process. In this session we would like to hear about the upcoming challenges and the most promising technological directions. We would also like to discuss opportunities to develop an overarching program in the US that could be used to seed a starting point in the Snowmass process.

5. Advances in Cosmology (Lindsey Bleem, Amy Bender, Clarence Chang, Katrin Heitmann)

Cosmology at Argonne provides many examples about how different technology and computing advances further the field. At Argonne, cosmology spans efforts in detector R&D, theory and modeling, high-performance computing, and machine learning and AI to build upcoming experiments such as CMB-S4 and help analyze results from ongoing and upcoming surveys such as SPT-3G, DES, LSST, SPHEREx, and DESI. During this session, we will hear about upcoming challenges and opportunities and Argonne's plans for the future.