

Draft: Snowmass at Argonne

Introduction

The final “Snowmass at Minnesota” meeting is July 29-Aug 6. It appears that there will be little occasion for high level discussions on the questions of scientific priorities of the various experimental opportunities before the final meeting; and no opportunity for discussions that cross the “frontiers”. At the final meeting in Minnesota, there will be several days devoted to “focus topics” which presumably will try to address physics questions without confinement to the “frontier” categories. After this, there will be summaries given for each of the “frontiers”.

This is a proposal to carry out an exercise to discuss the current situation in experimental HEP--**here at ANL HEP, among ourselves**--and to see if we can come to some consensus about scientific priorities and strategies for HEP before **mid-July**. The end product is proposed to be a document of ~150 pages that summarize our views that may or may not be submitted as a whitepaper to the Snowmass process.

Benefits

ANL HEP is unique in that we are a small enough division so that a discussion such as this can be handled relatively easily, while large enough to be working in almost all of the relevant experimental areas. We believe we benefit from this exercise in the following way:

- Provides an opportunity to discuss these matters in a more extensive and open way than is otherwise possible.
- ANL HEP division members will gain a clearer view of the existing opportunities and their context than is otherwise possible.
- Prepares us for the discussions at the real Snowmass meeting.
- Will result in (probably) a unique input into the US HEP planning process.

Ground Rules

This exercise is to be undertaken with the following general principles:

- We will evaluate the experimental opportunities in terms of very general physics questions.
- We will evaluate the scientific merit of the experimental opportunities. In the merit we will consider:
 - The measurements and their quality to be made at this experimental opportunity
 - Rough measure of effort (manpower and expense) associated with this opportunity
 - Rough expectation of the timeline of this opportunity.

Initial Input

The primary input will be the Physic Briefing Book

(http://europeanstrategygroup.web.cern.ch/europeanstrategygroup/Briefing_book.pdf) used by the European Strategy meeting. We may add supplementary material where appropriate.

Questions

The basic physics questions that are to be the bases of discussion are taken from “The Quantum Universe”:

1. Are there undiscovered principles of nature: new symmetries, new physical laws?
2. How can we solve the mystery of dark energy?
3. Are there extra dimensions of space?
4. Do all the forces become one?
5. Why are there so many kinds of particles?
6. What is dark matter? How can we make it in the laboratory?
7. What are neutrinos telling us?
8. How did the universe come to be?
9. What happened to antimatter?

In addition, there are three further questions for detector and accelerator R&D

1. What are likely new revolutionary developments in detector or accelerator technologies that could be expected in the next 10-20 years.
2. What are the salient characteristics of such developments in terms of performance and cost.
3. What are the timescales for such developments. Could they be speeded up with more effort?

Process

- Assign each of the 9 physics questions to a group of 3-4 physicists who will make:
 - A set of more specific sub-questions (no more than 5) where appropriate
 - A list of relevant experimental opportunities.
 - A considered strategy of how to proceed with the experimental opportunities in order to begin to answer the question.
- The three R&D questions are assigned to two groups (one for accelerator and one for detector) of 3-4 physicists each to be answered.
- The conclusion of each group is written up in a ~10 page document.
- The finding of each of the 11 groups is presented to the division, followed by general discussion.
- Rewriting of the documents in light of the discussion.
- A committee is formed to edit together the 11 separate documents. In addition, an attempt is made to answer the following questions for the concluding section of the overall document.
 - Can we set overall priorities from the opportunities listed in the 9 physics documents?
 - Can we make statements about the proper balance between direct physics research and R&D efforts.
- The overall document, particularly the concluding section, is presented to the division and discussed.
- Revise the final document according to the outcome of the discussion.